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Electrical World

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W. H. ONKEN, JR.
Editor

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Progress All Along the Line

GOOD indeed is the promise of 1928 for the electrical industry. The record shows that it is constantly marching on, undaunted by difficulties and undismayed by problems of the future. A slight slackening of pace is discernible, but when streams become wide and deep rapidity of acceleration is no longer their chief characteristic. They are none the less invincible in their onward flow and at the same time are, if anything, more tractable to the needs of commerce and industry.

The credit of the electric light and power industry has improved and will continue to grow better, so that the yearly financial problems of the utilities are no longer of such tremendous concern, however Gargantuan the appetite for funds may be. More than two billion dollars was acquired in 1927 for refunding and other purposes, and to get it entailed less worry than the raising of half a billion dollars five years ago. This augurs well for the other branches of the electrical industry, for with financial and engineering problems well in control greater executive attention can be directed toward enlarging the market for electrical energy and the translating apparatus which goes with it.

The tendency of the times plainly indicates that the most important function of the future will have to do with sales management. In both the manufacturing and the utility branch engineering has brought down the cost of production. Economies have been effected all along the line so that a standardized low unit cost of production may be said to have been attained. It is not so with distribution. While engineers have done their part and have done it well, the commercial man is still groping. Before long he will, he must be up and doing. Money is being spent faster than the actual demands for service justify. Fewer and fewer people now lack the advantages of electric service. The use of energy per capita, however, is still ridiculously low, indicating that both manufacturer and utility have done a mediocre sales job. Fortunately, both realize that this is true and are preparing to meet the issue.

* * * *

Dedicated to Service

DISCUSSIONS of the electrical industry are very apt to put emphasis on size without consideration of the economic fundamentals which underlie the millions and billions so glibly quoted. Size is important only as it makes possible a more effective disposition of the benefits electricity brings to modern civilization. Underlying the splendid growth of the electrical industry are values and services which have made growth inevitable.

During the past year material accomplishments have been recorded, but of far greater importance is the fact that the industry has gained a clearer understanding of its duties and its obligations. Industry consciousness exists that there is a job to be done and that co-operative planning and co-ordinated action are the tools to use for increasing electric service. The manufacturer, the light and power company, the communication interests and the transportation group have a common meeting place and a common opportunity for greater service and consequently better business. The industry is too big and interests are too closely related to permit a haphazard growth arising from the unplanned actions of the separate branches, and the past year has brought about a better conception of the potency of the old phrase "In unity there is strength."

American industry tends toward greater economy in production and marketing, and this results in narrower margins of profit, which are compensated for by a larger volume of output. The electrical industry has kept abreast of this great movement and in addition has furnished the equipments and methods which have made possible the economic developments in other industries. It is dedicated to industrial service as is no other industry.

* * * *

Price of Future Growth

ABOUT 70 per cent of the total construction budget of the power industry this year will go to provide distribution facilities. For it is an accepted principle that a utility company should spend money in sensible proportions to take on additional business. A capital investment is held to be justified if a proposed line extension offers sufficient load. But now the industry faces the question of how much should be invested to secure this business. And this question presses for an answer this year as never before.

It is an astonishing thing to men of other industries, the extent to which the power company in the past has been able to escape the necessity for spending money to develop sales. Manufacturers in other fields are constantly compelled to make courageous appropriations for invading this market or supporting that. Plant investments are also entailed. That is inevitable. But their chief consideration in budgeting must ever be, how much can be spent to create a larger volume of business? The executives of the power industry have never had any trouble with this as a major problem. The wheel is now turning, however, and the financial planning of the future must deal more largely with the apportionment of money to be invested in selling. It will no longer be enough to provide pole lines for taking on new customers. Growth will come from now on increasingly through the development of more sales to present customers—and in the residential field.

The waiting market for electricity in industry and in commercial use is still vast. It is a simple clean-cut selling job that needs much man power, much intelligent

sales engineering. But the way is clear. The more complex problem lies in the homes of the 17,590,000 customers now connected and using the service in so pitiably small a way. And here four necessities must be faced and overcome:

1. A public consciousness, a public interest and a public desire for complete electrical equipment must be created. That will require advertising on a scale beyond anything the industry has ever attempted.
2. The present obstacle of inadequate house wiring must be overcome. And this means that wiring must be sold vigorously and persistently that appliances may be conveniently used.
3. The selling of appliances must be organized on a far larger basis so that the standard of household equipment may be rapidly raised. The present progress does not even keep up with the growth in customers.
4. Rates must be made right so that the purchase and use of more appliances will be encouraged.

The power industry stands in the marketplace seeking business in competition with other industries that now hold the public interest. Success in selling will not come for the wishing. The situation calls for intelligent policies, generous financing, courageous leadership and adequate man power. That will be the price of future growth.

* * * *

Statistics Need Interpretation

FIGURES are dangerous things in unskilled hands. Industry statistics, when used by academic statisticians and by men who do not have an intimate knowledge of the industry whose operations are evaluated in statistical terms, are apt to lead to erroneous deductions. Electrical industry statistics afford enormous totals. These totals are quite accurate, furnish basic measures of industry accomplishment and serve as guides for building a better industry. But the totals involve definitions of such terms as "capitalization," "value of plant and equipment," "generation," "transmission," "distribution," "power," "lighting," "commercial" and other expressions which are understood by men of the industry but may be misinterpreted by the layman. In this issue of the ELECTRICAL WORLD these words are defined, but too frequently the casual statistician or lay reader makes his own definitions, with resultant misapprehensions.

It is unit and average values that give the most erroneous impressions. It is human to generalize. The layman likes to say a steam power station costs so many dollars a kilowatt and a hydro station so many more dollars per kilowatt, and he arrives at these averages by using total industry data. An electrical man smiles at such statements as they are normally applied. Then again average unit rates may be computed and used as generalized figures, or some one may become a financial wizard by using a little arithmetic and total values. Such expositors do not know industry conditions or the proper interpretations to be placed on these values, and it is difficult to explain to them that unit statistics are no better and no worse than total values and serve as the same yardstick for measuring the relative growth or trend of the industry over a period of years.

This country now makes a fetish of statistics and accepts them in large doses from many sources. Many of these statistics have no real father or mother but are never at a loss for foster parents. Official orators and publicists find the soft spots in hard-headed business men through the use of statistics. Figures support the official foolishness so prevalent in American commercial life and are the false as well as the true guides to business prosperity. They should be used intelligently or not at all.

* * * *

Electrical Budget for Home Owners

AMERICAN homekeepers have adopted the budget. They are beginning to think about their budgets for next year. Shoes, clothes, theaters, the automobile and many other items will find a place in this budget, and plans will be made for the purchase of commodities and services designed to increase the comforts and pleasures of living in 1928. But the electrical industry has not sold to the home owner the electrical item for his budget. The light bill may find a place, but too frequently it will be labeled "incidental expense."

Large plans are in the making in the electrical industry for the sale of its products and services to the American home. Why not make the home budget an objective in this program? The 1928 budgets of homes everywhere in the land should include allocations for the electrical betterment of dwellings as well as for the replacement of furniture, draperies and floor coverings. Such appropriations need not interfere with the later financing of "red seal" and other installations over a longer period, and the habit of including electrical betterments in annual household budgets should be formed and acted upon from this time forward. Innumerable customers of electric service companies have yet to realize that a properly balanced household budget should provide for systematically improving the home along electrical lines, and in the coming months lies a real opportunity for the industry to influence homemakers in a most desirable field.

* * * *

Profitless Prosperity

INDUSTRY in the United States has for several years tended toward a volume basis. In general, great manufacturing enterprises are conducted on the Ford plan of quantity production and small profit per unit. This is satisfactory as an expedient to overcome localized distribution of products and to meet an economic trend, but it does not lead to anything, ultimately except a "buyers' market"—that business situation in which the purchaser dictates the price and the seller takes what he can get, knowing that if he does not do so his competitor will.

Reports from almost every field indicate that industry is reaching this condition. Buyers are learning that they can get materials at their own price. As a consequence, business is showing little, if any, curtailment in volume, but the poverty of an ungainful trading margin is upon it. Merchandising counselors advise a reduction of distribution costs, but this is only a temporary alleviative in such cases as it may be remediably applied.

A prominent economist says "all the great basic raw-material-producing industries, such as coal, chemicals, agriculture, metal mining and some of those closest to them, like the wool and cotton textiles, leather, and lately iron and steel, have certainly shared little or none of the restless, shifting and selective prosperity which has been so extravagantly hailed. Thanks to the easy-money policy of the Federal Reserve System, the stock market has been doing some fancy aviation, but there has been no real business boom in this country since 1923."

All extremes are untenable. Life and activity tend to intermediation, and conditions must come closer to

those of a "sellers' market" than they are now before there can be "good business." It is useless to talk of sales volumes and unbelievably large funds in the banks and invested at absurdly high prices in stocks and bonds. The return on the investment is the only factor that possesses ultimate significance. The solution is simple but exceedingly difficult of achievement. A fair price to the purveyor—he to insist upon it and the buyer to pay it. This requires courage of a high order and unprecedented co-operation on the part of the producers as well as understanding and fairness on the part of the buyer.

* * * *

Thrift in Engineering

ENERGY losses in the systems of the light and power industry of America last year were equal to the total energy generated in 1913. The losses were twice as large as the electric railway load and nearly equal to the total lighting load. These losses—14,000,000,000 kilowatt-hours—represent 20 per cent of the total energy sold. Here is something for the industry to think about. Engineers can reduce these losses. They have done it on several properties, and the economic limit of reduction is easy to fix. But most engineers do not like to tackle the job. They would rather design power houses to gain a fraction of one per cent in efficiency or focus their attention on problems connected with the design of new substations. Big things involving money expenditures are more interesting to most men than little things and money savings. The natural, undisciplined human being is extravagant rather than thrifty.

On every property loss reduction should receive the attention of the best engineering talent. It is not a task for a maintenance man or a construction foreman. The way to reduce losses is to make precision measurements and precision installations and to institute precision operating methods. Each machine, transformer, transmission line and distribution service must be measured, weighed against the service required and revamped to develop its maximum operating economy. Precision housekeeping must go on day after day and week after week. A loss-reduction maintenance crew must go much further than the ordinary maintenance crew.

* * * *

Keep the Banker in His Bank

THE light and power industry has been built by able men. Each large property or group of properties is generally dominated by the personality of the man who has fought to victory on the firing line. He has handled the public, the operations of the system, the finances and the policies, and his strength has made possible the achievements of his company. The industry is fortunate that these men have been behind it during its life of forty years and still control the destinies of most of the properties.

But conditions will change. These men cannot live forever, and very often no qualified subordinate stands ready to step into their shoes. Again, the business has become so big that one-man operation has disadvantages, and the committee type of executive control common to modern business is likely to come into being. Still another factor to be weighed is the fact that enormous amounts of utility securities are now in the hands of bankers. Many of these bankers have developed a practice of directly participating in the control and management of the industries whose securities they hold. Banking activity of this sort started on a small scale, but in some industries it has progressed by leaps and bounds.

Banking control of electric utilities is not desirable. Bankers are ultra-conservative, whereas the light and power industry has succeeded by quickly grasping and using the new and better equipment and methods that have evolved with the rapid development of the science of electricity. Success in the utility business is based on good public relations. Managements must "feel" their public and be responsive to its moods. Only those who actually live among the customers they serve can be fully responsive to the customers' needs. Here again the banker is out of his element. Another element in banking control is that bankers are out to make money first and last. They are cold-blooded business men and may force financing or start projects which will make money but which will not be conducive to better and more economical service to the public. No rightly actuated executive in the light and power business has made money his primary object in building a property.

Weighing these elements in the scales, it is seen that banker control of a public utility business is bad for the business and bad for the public. It is to be hoped that men will be found in the utility industry who have the strength and courage to tell their bankers to remain in their banks.

* * * *

The Business Outlook for Electrical Men

IN THESE pages many leaders have contributed their opinions as to the business outlook confronting the electrical industry at the beginning of this new year. Boiled down, it resolves itself into the consideration of the several favorable and unfavorable economic factors which stand out in the prospect for American business today. These may be taken as follows:

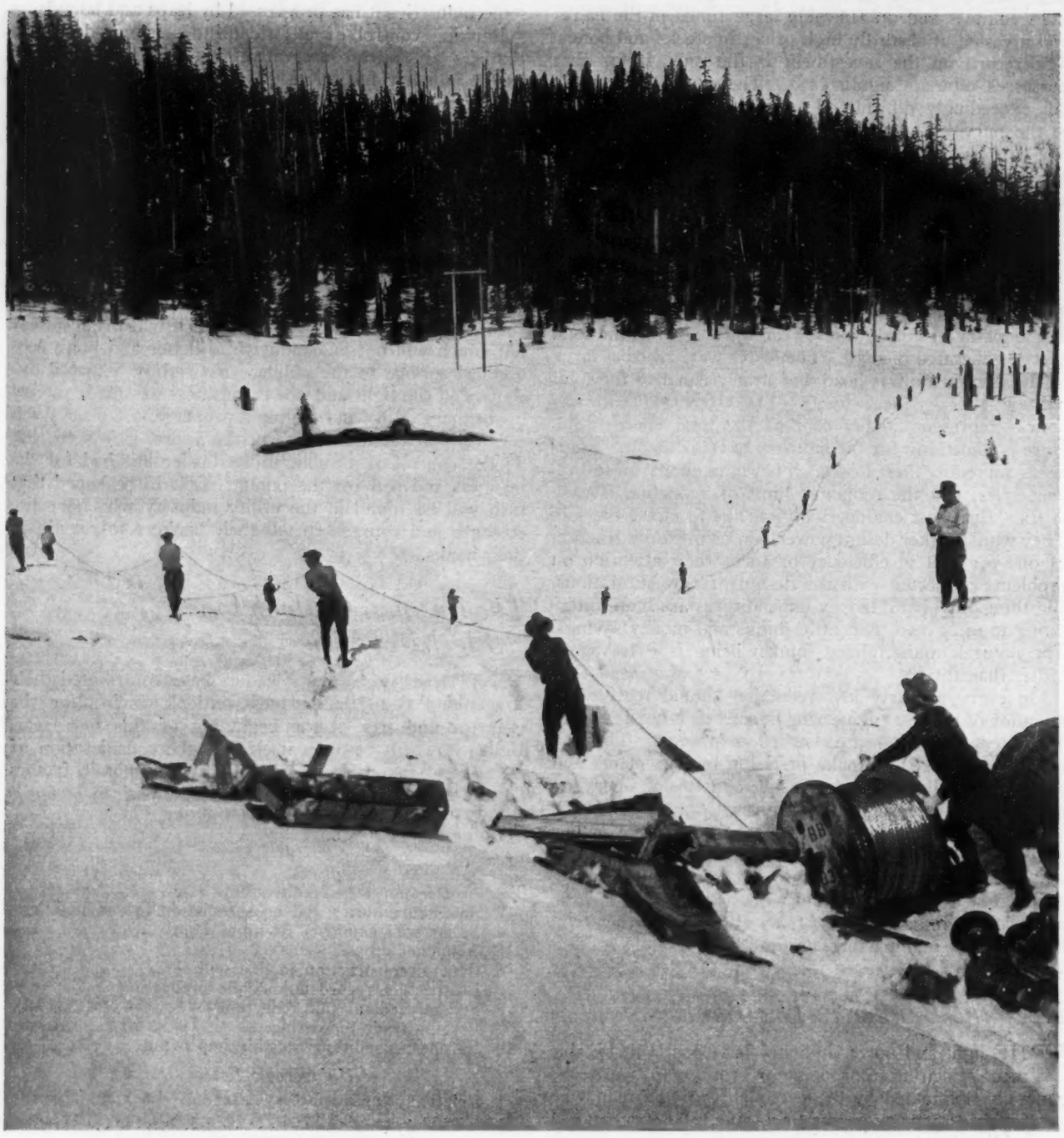
Favorable Factors

1. No inflation of prices.
2. Ample supply of credit at low rates.
3. Small inventories and no speculation in commodities.
4. Labor well employed at high wages.
5. Abundant crops.
6. General construction in line with 1927.
7. Prospect of record automobile production.
8. Further federal tax reduction.
9. Foreign trade increasing.
10. European conditions steadily improving.

Unfavorable Factors

1. Relatively unsatisfactory earnings in manufacturing industries.
2. Presidential election presents political hazards.
3. Germany's maximum reparations this year may disturb European economics.

As a balance sheet, the favorable influences would seem to so far outweigh the unfavorable as to give every reasonable expectation of what President Coolidge has termed "a comfortable prosperity" in 1928. The forces which make for stability in the business world appear to be in dominant strength. It is safe to say, therefore, that prosperity in the electrical industry this year is going to be largely what electrical men make it. If the four organized branches of the industry are serious in their decision to join hands and go forward enthusiastically with a broad program of market development, we should create our own prosperity. For our era of sales is just beginning and our opportunity lies ahead.



Courtesy Great Northern Railway and Stone & Webster

LINE CREW AT WORK ON 110,000-VOLT LINE FOR GREAT NORTHERN RAILWAY AT THE SUMMIT OF THE CASCADES, WESTERN WASHINGTON

Light and Power Utilities Will Spend $900,000,000 in 1928 for Additional Facilities

1927 1928

IN 1927 more than 46,000,000,000 kw.-hr. was generated in the fuel-burning stations of the light and power industry and 29,000,000,000 kw.-hr. in the hydroplants. For several years more than 60 per cent of the energy used has been generated from fuel, and this percentage is apt to increase in the future. Economic, political and engineering handicaps to waterpower development become greater each year; because of these handicaps and because of advantages possessed by fuel-burning stations, it becomes increasingly difficult to find economic justification for large water-power and transmission projects in localities distant from load centers.

* * * *

SINCE 1913, the total energy generated in the light and power industry has increased six times. The energy used for lighting has increased six times, that used for power eight times, and that used for railways less than twice. Yet in this period the losses of the systems have increased five times; they are twice the railway load and nearly equal to the lighting load. Here is a big job for utility engineers.

* * * *

THE GROSS revenue of the light and power industry is now $1,783,000,000. Lighting customers pay $1,000,000,000; power customers, $500,000,000; railways, $60,000,000, and intersales among utilities account for $129,000,000. Sales of energy among utilities have doubled since 1921, and this fact affords economic justification for the growth of interconnected transmission systems.

* * * *

THE light and power industry used more than 37,000,000 tons of coal in 1927. Each year for several years the consumption of coal has increased at the rate of about 1,000,000 tons a year. This rate of fuel consumption has been constant despite the rapid increase in generated energy, because major economies in the use of fuel per unit of energy generated have been brought about. In 1927, for example, through these economies the industry saved an amount of fuel equal to the entire industry consumption in 1913 based on the unit fuel consumption in 1913. The 37,000,000 tons used is a small proportion of the 700,000,000 tons of coal mined each year in this country, and the engineers of the utility industry are not conceding that they will not bring about still greater efficiency in fuel consumption.

* * * *

THE Atlantic and North Central States generate nearly 75 per cent of the total energy generated in this country. The South Central states have increased their generation most rapidly since 1922; the Far Western states are second in rate of growth and New England states have grown very slowly in the same period. In no section of the country is there evidence of saturation; markets are yet available equal to those now served.

* * * *

SOME loads attract keen commercial interest. With a use of energy averaging 1 kw.-hr. a day and a monthly revenue of $2.50, there is concrete evidence that electric service can be intensified in American homes. The value of the service is evident; home owners desire the service but it must be sold. The home load should be doubled in 1928.

* * * *

WE ARE now experiencing the most remarkable advance in productive efficiency in the history of modern industry. The first industrial revolution was brought about by the invention of machines and the present revolution is brought about by the application of new processes and methods to the use of machines. It is not electricity in itself nor electrical machines in themselves that make for industrial prosperity; it is the electrical method. Continuous production under precision conditions with a maximum output per unit of capital, space and labor is made possible by the electrical process of production; the automotive industry, for example, is producing three times the number of cars it did in 1914

in the same time with the same workmen. Electricity makes possible a tremendous mechanization of production processes.

* * * *

WITH generating stations aggregating 28,990,000 kva.; with thousands of miles of high-tension transmission lines; with other thousands of miles of distribution circuits, and with hundreds of substations, buildings and other facilities, it might be thought the utility industry was ready to satisfy all service demands. But the demand for electricity is on the increase and the market is not saturated. During 1927 these utilities spent $760,000,000 for additional facilities and their budget for 1928 aggregates over $900,000,000. This is an enormous sum to be spent wisely in one year.

* * * *

IN 1927 the gross revenue of the light and power industry was $1,783,000,000 and the net was $1,017,000,000. This represents the generation of more than 75,000,000,000 kw.-hr. for the service of 21,694,100 customers. More than $8,000,000,000 is now invested in facilities for giving this electrical service to the nation.

* * * *

WITH 6 per cent of the world's population, the United States has about 60 per cent of the world's telephones. Fifty years after the first commercial telephone line finds 18,500,000 telephones in use in this country. Telephony is distinctly an American art.

* * * *

ELECTRICAL manufacturers of heavy equipment did a gross business of about $1,000,000,000 in 1927. Appliance and radio manufacturers did a business of about $2,000,000,000 in this period. These totals are enormous, but the check on prosperity is found in net earnings and in this respect many manufacturers say margins of profit have been very narrow. The electrical industry should have a prosperous group of manufacturers, for they are chiefly responsible for new developments in electrical equipments. Their earnings should support a development program.

AMERICAN industry is only 75 per cent electrified. Much of this electrification has been done crudely and with the idea of substituting electric power for mechanical drives. But industry is awake to a different idea in the use of power. It realizes that electrification is a process and not a group of motors. Production per unit of factory volume can be increased by the use of electric heat, electric controls and electric motors—this use to be fixed by a production process that utilizes the maximum possibilities of the electrical method. There is a big business in industrial electrification.

* * * *

THERE are, as the old year ends, 4,409 light and power systems in this country, and they serve 21,694,100 customers. Investors have spent more than $8,000,000,000 for plant and equipment to give this service. Over $2,000,000,000 of the securities of light and power companies were sold in the money markets during 1927—a quarter of the total securities sold in this country. Investors have faith in the electrical industry because of its honorable record for honesty and service.

* * * *

IN 1907 there were 1,946,979 total customers of electric companies; the lapse of twenty years has multiplied this figure by more than ten and in 1927 domestic customers numbered 17,596,000. About 63 per cent of the people now live in homes served by electricity and during the past few years the net increase in customers each year has been about 1,500,000. New customers will continue to be had, but there is an enormous market for giving more adequate service to existing customers.

* * * *

DURING 1927 all points in Great Britain and the United States were put into touch with one another through transatlantic telephony. Cuba and Canada have also been added to the connection, which gives 10.5 hours of daily communication facilities. Another notable telephone interconnection is the completion of a direct line from the United States to Mexico. World-wide communication is now established on a commercial basis.

The Light and Power Industry in 1912 and 1927

	1912	1927
Number of customers	3,837,518	21,694,100
Number of people in homes served by electricity	14,000,000	75,500,000
Kilowatt-hours generated	11,569,000,000	75,116,000,000
Gross revenue	$302,273,000	$1,783,700,000
Total generating rating, kva.	6,450,000	28,990,000
Value of plant and equipment	$2,175,678,000	$8,084,000,000
Annual expenditures for new facilities	$100,000,000	$760,353,000

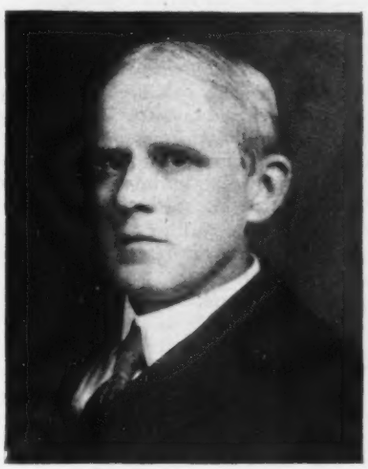
Executives Optimistic About Industry Conditions

Interconnection Based on Economic Principles

By Henry I. Harriman

Vice-Chairman Board of Directors New England Power Association, Boston, Mass.

ONE of the outstanding features of electrical progress in the last year has been the steady growth of interconnections between large electrical companies throughout the country and the general recognition on the part both of the companies and of the public that



H. I. HARRIMAN

there was mutual gain in such interconnections.

These gains may be classified under the following heads:

1. It enables the most efficient plant to carry a substantial part of the load.

2. It decreases the amount of reserve capacity which each separate plant must keep for emergencies.

3. It gives assurance of safety and continuity of service.

4. Through diversity it tends to reduce the total electrical peak of a given area.

The developments in high-tension cables will also be an important factor in extending interconnections between large power stations, as many of them are located in the heart of thickly settled sections where high-tension overhead lines cannot be built. Both New York and Chicago have cables operating successfully at 132,000 volts, and cable makers are now discussing 220,000 volts.

One of the most important factors in the growth of interconnections is the general recognition that they can be carried out by the voluntary action of the various companies without effecting consolidations of companies and without changes in existing laws. In fact, the interconnections of large generating plants may be considered the natural outgrowth of economic principles.

All Promises Kept During Past Year

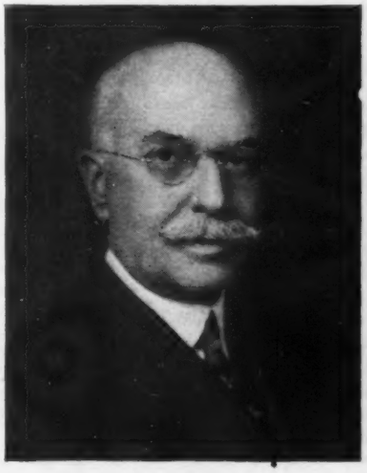
By W. S. Barstow

President W. S. Barstow & Company

THE year 1928 opens with the electrical industry established upon a firm foundation and the impetus given by public appreciation will carry it far beyond past accomplishments.

No one could have visualized forty years ago the present state of the art, and no one can visualize today its position forty years hence. It could never have been imagined that the seed sown but a half century ago could blossom into an all important factor in national progress.

The past year of physical and financial expansion has continued to follow strictly economic laws. In the beginning of electric service the kilowatt hour (if this unit had been used) cost the public more than twice what it does today. What is, however, of more importance to general public welfare is that at the present time, due to large interconnected generating plants and expansion of distributing systems, electric service has been made available to almost every section of this country. Great results have been attained in the past and the future promises even more. We speak of progress and prosperity of a nation and yet often do not realize the important part played by electric service in increasing the individual efficiency which results in such progress and prosperity.



W. S. BARSTOW

Industry Will Grow to Extent It Serves

By J. J. O'Brien

President Byllesby Engineering & Management Corporation

AS LONG as electric utilities continue to increase the efficiency and production of individuals and industries they will grow, in my opinion. While at present general business conditions in the territories in which Byllesby companies operate (with some few exceptions) are not so good as a year

J. J. O'BRIEN

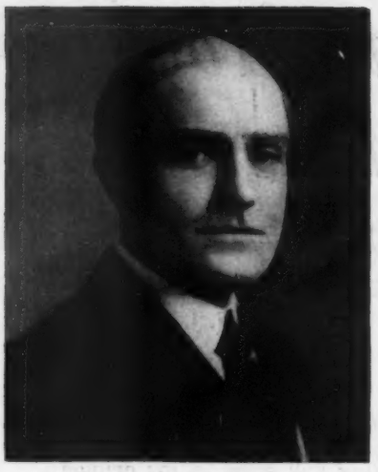
ago, I do not believe that anything approaching "hard times" is in prospect for 1928. Electric utilities will continue to grow; they will grow more rapidly at one time than another, but even in lean times they possess the ability to show progress and maintain earnings at a point sufficient to secure the inflow of new capital for additions and extensions. Only extremely unwise political action can prevent them from continuing in healthy condition—that is to say, in position to render adequate public service based on a sound financial status.

Service Expansion— An Achievement

By Britton I. Budd

President Public Service Company of Northern Illinois

DURING 1927 the electrical industry moved steadily forward, its progress being marked by conservative development in many branches rather than by any single outstanding achievement. The extension of adequate utility



B. I. BUDD

service to suburban areas has enabled these areas to enjoy such conveniences as were formerly afforded metropolitan communities. This suburban development now is acting as a magnet, drawing heavily on our congested centers of population and gradually enlarging the scope of rural utility service.

A number of satisfactory experiments in farm electrification were conducted by utility companies during the year, with the result that the application of electrical energy to farm operation has taken a long step forward. Numerous superpower interconnections between neighboring companies were completed during the year, providing additional assurance of uninterrupted service to customers and investment economies to the companies. All of these things have contributed to the sound financial position of the industry as a whole.

Southeast Plans $40,000,000 Budget

By T. W. Martin

President Southeastern Power & Light Company

THE forecasts of the increased demands that will be made upon the system of the Southeastern Power & Light Company during the next twelve months have now been completed and we are actively going forward with plans to meet these demands. While there has been during the last few months a slight recession in business activity in the territory, this has been overcome and building activities are substantially above those for the corresponding period of 1926. The trend of electric power demands has been constantly upward and we are making our plans to supply a total energy demand of 2,500,000,000 kw.-hr., as compared with 2,100,000,000 kw.-hr. for 1927.

In other words, we are expecting a 20 per cent increase in the output during 1928. The demand for power is now a well-recognized barometer of business conditions, and the demands on our system from present customers and the many new activities being undertaken in the territory served indicate that we must make provision for greater and still greater demands.

To the end of meeting the expected demands, we are making plans for additional generating facilities and distribution lines, requiring an estimated expenditure in 1928 of $40,000,000. This will include part of the cost of an additional steam plant to be erected in Alabama in the Warrior coal fields, recently announced, construction of which has been started, and the first unit of 80,000 hp. capacity should be in operation during the fall of 1928. This new station is designed to permit an ultimate capacity of 270,000 hp. to be developed as demand requires and is in addition to the 100,000 hp. Gorgas plant.

We also expect to bring into operation in the fall of 1928 the Jordan dam, with an initial installation of 144,000 hp., and the Tallassee plant, with an ultimate capacity of 75,000 hp. Plants

T. W. MARTIN

are also under way for the beginning of construction in the near future on additional power developments on the Savannah River and other streams in Georgia.

Upon the whole, we look forward with confidence to the year 1928.

Expects Expansion Despite Conditions

By Martin J. Insull

President Middle West Utilities Company

WHATEVER the course of business as a whole during 1928, the electric industry will inevitably continue to expand. And for the same reasons that the industry as a whole will expand, the properties under the direction of so-called "holding" companies will grow relatively more.

The reason lies in the stage of development at which the electric industry now stands—a stage far from saturation. Since the "holding" companies serve chiefly non-metropolitan territories, in which development has not yet progressed as far as in the more densely populated centers, they naturally face a continual and more emphatic growth. The small communities and the farms, mines, oil fields, quarries, irrigation and drainage systems and other such power users spread over the countryside constitute a field of development which is far from completely electrified.

Companies operating in such territories face both an external and internal growth. It is logical to suppose that they will continue to bring into their systems, from time to time, isolated local plants in communities the service requirements of which can be more adequately met by a larger system. In addition to this they must meet a constant growth in the demand for service in territories already served. There are small communities that have no electric service at all to which transmission lines must be extended. Rural electrification is in its infancy. Domestic use of electricity both for lighting and for labor-saving appliances can be made much more general.

This increase in demand for electric service appears simple enough in the homes and industries where it is taking place. The raising of new capital with which to build the necessary generating and transmission facilities to meet the requirements of any one individual is a simple business operation. When, however, each such operation is multiplied by millions—the population of the country—it results in a staggering figure to which "trust" and "octopus" are unthinkingly applied. I think those who react in this way to the growth of the electric industry fail to realize the size of the country, which is the explanation of large figures which seem to cause alarm. The companies whose service is constantly being extended are fully understood by the customers whom they are serving and the investors whose capital they are enlisting in this work. Such opposition as there is is an opposition growing out of fear of size—a size that the development of the country necessarily requires—and is not the feeling, I am confident, of either the customer or the investor toward the electric industry.

MARTIN INSULL

Stability and Progress Manifested

By Charles L. Edgar

President Edison Electric Illuminating Company of Boston

THE two most important things that have happened to the light and power industry in New England during the last year are, first, the prominence which was given it by the recent floods in New Hampshire and Vermont, and, second, the publicity given to its affairs through the New England Council.

Both the public and the technical press have very clearly brought out the fact that wherever power companies have improved the rivers of New England, primarily for their own purposes, they have, in fact, controlled the flood problem of these various rivers. One river in particular, the Deerfield, controlled and regulated from its source to its mouth, stands out as a shining example of the effect that this development has had upon the control of its waters during the time of flood. If all of the rivers of New England, as far as commercially possible, had been developed to anything like the extent of the Deerfield River, the damage from flood would have been almost negligible and would have attracted very little attention throughout the country.

Up to within a year or two ago there had been a pronounced feeling in some parts of New England that the power companies were not living up to their opportunities and that their development was lagging behind that in other sections of the country. Through some of the committees initiated by the New England Council a very comprehensive study of the actual facts was made during the last year. It was shown beyond question that, relative to its population, New England, from the standpoint both of investment in its power companies and in their output, is ahead of the rest of the United States and that the proportion of kilowatt-hours manufactured by water power and by steam power in New England alone is almost exactly the same as for the entire United States.

Through these same committees a scheme has been developed by which those companies engaged in interstate transmission of electric power can have their activities regulated to the same extent as if they were engaged only in intrastate transmission. This has been brought about by inserting a clause in interstate contracts, agreeing to abide by the decision of the commissions of the two states sitting jointly, all this, of course, without the intervention of the federal government.

C. L. EDGAR

Election Year No Menace

By B. C. Cobb

Vice-President Commonwealth Power Corporation

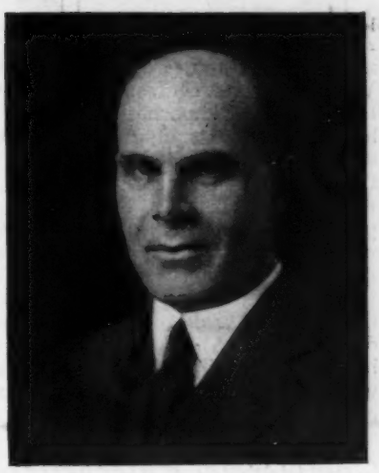
DURING 1927 public utilities, and especially the electric power and light industry, forged ahead at a remarkable pace. I am inclined to think it will continue to do so in 1928, although new construction budgets for the plant and facility expansions will be somewhat under the 1927 figures. Present indications are for continued prosperity during 1928. There will be ups and downs and declines in certain lines, but in that respect 1928 should differ little from 1927, and surely no one can say that 1927 was not a prosperous year notwithstanding the fact that some lines of business did not maintain their rate of output.

B. C. COBB

The power and light industry is growing rapidly, with tremendous benefit to customers and the public. There is no such thing as an electric trust, about which we hear so much, and any federal investigation that may be made of the industry can do no permanent injury.

While both electric power and gas consumption are expanding rapidly, there is ample room for both, and neither need fear competition from the other.

The electric railway industry is apt to meet more problems than the other branches, as the private automobile has created serious competition. The public is fully alive, however, to the importance of electric railway service, and all communities throughout the country, with the exception of New York City, have recognized that the 5-cent fare is a thing of the past and that if the electric railways are to continue to serve, they must be allowed to earn.



C. W. KELLOGG

Some uncertainty has frequently attended election years and some anticipate business hesitation on this account during 1928. In my opinion, this does not mean as much at the present time as it used to mean, especially if the candidate whom the public wants is nominated and elected to the Presidency, as I think will be the case.

Industry's Problems Are Being Met

By C. W. Kellogg

President Engineers Public Service Corporation

THE year 1927 has given renewed proof of the fundamental stability of the light and power industry through the continued upward march of its earnings in the face of a recession of general business activity, which was particularly noticeable in the latter half of the year. Probably the outstanding development of the year has been the realization by home and foreign observers and American labor of the important contribution which the application of electric power to industry has made to the prosperity of the country and the maintenance of high wages. It has been a good year—a year of progress. The continuation of the present favorable trends depends in large measure upon the policy and efforts of the industry in maintaining, improving and extending its service.

I think there is no doubt that 1928 will be a good year for the light and power industry. It will be affected somewhat, though less than other industries, by the general prosperity of the country, the prospects for which are good from the present outlook. In any case, the continuation of vigorous merchandising policies should bring some new business to the industry regardless of general business conditions. With the continuous development of uses for electric service and electric

power in many lines, particularly in the American home, I can see nothing but a prosperous future for the industry. We are always confronted with problems; the most important ones now perhaps are the extending of our service to rural territory on a fair basis to the farm population served and to the investor who furnishes the money, the protection of the industry from unwarranted attacks and the maintaining and increasing of public confidence in the industry, both among our customers on the one hand and among our investors on the other. All of these problems are being met intelligently, I believe, and will be worked out to the best interest of all concerned.

Commercial Enterprise Is Vital to All

By Luke C. Bradley

President Narragansett Electric Company, Providence, R. I.

IT IS the duty of the power companies to bring to the attention of the people as quickly and completely as possible the comforts and blessings of the varied and manifold uses of electricity. The central station is the best clearing house for this movement, for the art develops rapidly from many sources and the electric shop is the best agency for creating electrical atmosphere in the community. If the utility company admits its responsibility here, it must display and sell appliances. The electrical dealer is not in business for altruistic motives, and the utility is not interested in the sale of appliances *per se* so much as in popularizing electrical service. Of course this means added revenue, but it means increased business for the dealer through a more general community consciousness of electricity and more rapid progress through the greater ability of the central station to keep abreast of the latest advances and make them available to all. Central-station merchandising is the greatest spur to contractor-dealer prosperity ever put to work. If our homes and business houses continue to accept electricity in social and business life, the business of the central station will increase enormously and the extent of the increase will enable the utility to make such rate reductions from time to time as may be economically justified. Thus commercial enterprise is vitally essential to increased prosperity for the electrical industry and the general public.

L. C. BRADLEY

O. H. CALDWELL

Radio Broadcasting in 1927 and 1928

By O. H. Caldwell

Member Federal Radio Commission

THE year 1927 made radio history in several important respects. A basic law for radio control and regulation was passed by Congress. Television, or "seeing by radio," was accomplished and widely demonstrated. The lampsocket receiving set became a commercial product, merchandised on a large scale. Adequate radio channels have been cleared reaching into every city, village, rural, farm and remote mountain dwelling in America. And by international agreement among 70 nations, future operations and developments in the whole radio spectrum have been outlined and protected from interference.

Looking forward to 1928, interesting possibilities present themselves. In the short-wave region, we may expect during the year a rush of applications for channels, which in its commercial, industrial and economic reverberations will make the recent episode in the broadcasting band seem mild by comparison. Aside from all other communication demands, it is clear that future aviation progress will depend wholly upon these short waves for communication to airplanes in flight. In the broadcasting band, through various methods of synchronizing the carrier frequencies of stations, we may succeed in multiplying by several times the carrying capacity of existing channels for regional stations. Chain operation on not one but on three or four frequencies (instead of 20 or 30) may further economize our precious channels. Single-side-band transmission may cut the present ten-kilocycle separation nearly in two, further doubling the channels. Meanwhile broadcasting service in cities may during 1928 start on its inevitable transfer to local wire systems (telephone or electric light), leaving space radio to serve the open spaces.

In general, therefore, during 1928, the spotlight of public interest in radio, as of invention and commercial development, will turn upon the long reaches of the radio spectrum *below* the broadcasting band.

Utilities Are Conscious of Responsibilities

By H. T. Sands

President National Electric Light Association

THE character of the service rendered by electric light and power companies makes it imperative that plans be made and facilities provided in anticipation of the demands of the public. Whether or not we are to experience a recession in industrial activity during 1928, such as we have witnessed in other presidential years, the electric light and power industry must of necessity continue with its plans for expansion and development. The industry is constructively planning for the future and substantially along lines which have been proven to be sound and in the interest of both the public and the investor.

The outstanding feature in generating equipment is the constantly increasing size of units, with attendant reduction of production costs. The work of interconnection, the soundness of which has already been demonstrated, will doubtless be carried forward in an increasing measure during the coming year. The tying-in of isolated properties into interconnected systems, which are in turn connected with both steam and hydro plants, will make possible the greatest use of the water powers of the country and assure reliable electric service distributed over wide areas.

The extension of electricity to farm homes and farm work promises to continue with accelerated pace during the

H. T. SANDS

R. F. PACK

next twelve months. Out of the co-operative effort now being conducted on experimental farm lines in twenty-one different states, both the industry and the farmer are constantly learning new uses for electricity on the farm.

The important work of improving and maintaining sound public relations is being carried on by some of the ablest executives in the industry. The results of this work are apparent in a more sympathetic understanding of our industry and a larger measure of confidence in its integrity and stability.

The industry looks forward to the twelve months just ahead fully conscious of its responsibility to the public it serves and to the investor whose money makes possible its service.

No Fear of Impartial Investigation

By R. F. Pack

Vice-President and General Manager Northern States Power Company, Minneapolis, Minn.

OUR industry must sail through a little squall at Washington, where a number of matters directly affecting the electrical business are under Congressional consideration. Provided we ourselves refrain from becoming panicky, I think there is little or nothing to fear for the following reasons:

1. The people themselves are opposed to the government engaging in the electrical business. This is indicated not only by expressions of opinions of individuals all over the country but by the vote in the only three states where it has been put to a test at the polls. In California state ownership was defeated three times by ever-increasing majorities. It also was defeated in Oregon and in South Dakota.

2. Therefore it is not surprising that a survey shows that 90 per cent of all daily newspapers of more than 5,000 circulation are editorially opposed to government ownership and operation of public utility companies.

3. Of our 435 Congressmen and 96 Senators not more than one or two are avowed socialists, and certainly not more than 25 have any sympathy whatsoever toward the theory of government ownership, and I think we have every reason to believe that whatever comes before this Congress will receive fair and impartial treatment. We have no right to expect anything more.

4. While here and there, there may be something to criticize in our industry, just as there would be in any young industry which has grown to major proportions within a comparatively few years, there is vastly more for which we are entitled to feel justly proud. I believe the people to be inherently fair, and therefore have no fear of an impartial scrutiny of our history.

5. For years we have been building a cordial relationship with our customers on a foundation of good service, fair dealing and courtesy, and the business wisdom of such a policy will make itself manifest now.

We have little to be ashamed of and much to be proud of. It is our business to see that the truth goes before the people. The only thing I have ever feared is ignorance. Congress may readjust our sails a bit, but I am confident we shall emerge from the Congressional squall an even better industry ranking high in public confidence.

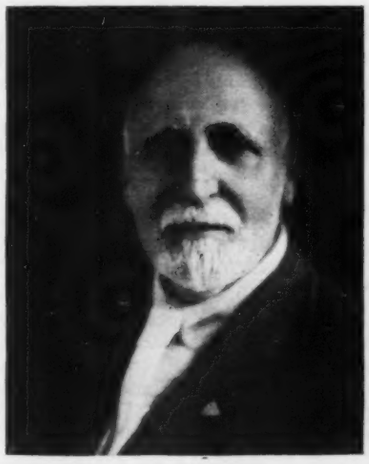
"Complete Electric Service" for 1928

By R. H. Ballard

Executive Vice-President and General Manager Southern California Edison Company

IN MY opinion, 1928 will see the eyes of the electrical industry focused on commercial activities and the minds of electrical men concentrated on the problem of increasing our business with existing consumers. The modern six-room house occupied by a family with an income ranging from $3,000 to $5,000 can use from 2,500 to 3,500 kw.-hr. a year—to the great comfort and economic advantage of the entire family. To do this their annual operating budget would not be increased and they would be using an electrical standard only in keeping with their standards of dress, amusement, education and transportation.

We can advocate a greater use of electricity with all sincerity, because it means better food, better eyes, better health and a high degree of general comfort and convenience. Sometimes I think the public has a greater appreciation of the advantages of electricity than have the members of our industry. A well-planned campaign among our own employees is the first step in developing this tremendous latent market. "Complete electric service" would be a good slogan for 1928.



ALEX DOW

SO FAR as I can see, the first few months of 1928 will be months of continued caution. Thereafter the prospects are for steady improvement of business.

By Alex Dow,
President The Detroit Edison Company

R. H. BALLARD

Employees Are Company in the Public Eye

By A. Emory Wishon

Vice-President and General Manager San Joaquin Light & Power Corporation and the Great Western Power Company

THE most valuable medium for promoting the understanding of the utility and its problems is the utility organization itself and with it the first educational work should be undertaken. Ours is not a business merely of the executives; every worker of the rank and file is a part of it, and to customers the meter reader, the service man and the girl behind the cashier's desk are "the power company," rather than the private office men whom they rarely if ever meet. Executives know the story that should be told the public; too often the rank-and-file workers do not know it. Yet each of them makes perhaps as many contacts as do the executives, and because of their number they are an infinitely greater force for publicity. They have opportunity to tell the utility's story in the most effective way it can be told—personally, to friends and acquaintances who know them and like and respect

A. E. WISHON

them. The manager wants the public to have friendly understanding. He depends upon his organization to promote it. His first and most important step toward informing the public, therefore, should be to inform his employees.

Farms Like Industry Benefit from Electricity

By A. W. Leonard

President Puget Sound Power & Light Company

NO GREATER service can be rendered by the electrical utilities of the nation than to carry the conveniences and economy of electricity to the farms of America. Electrical utilities of the Pacific Northwest believe that electricity can do for agriculture what it has done for industry. Through intensive cultivation of electrical applications on the farm with a sympathetic understanding of the farmer's problems the Puget Sound Power & Light Company has developed a profitable rural load and at the same time has improved the enonomic status of the farmers of western Washington. During 1927 our company connected more than 5,000 additional rural customers to its lines, and already more than 75 per cent of all homes outside the corporate limits of cities and towns in this territory are enjoying the benefits

A. W. LEONARD

of electric service. In this electrification program we feel that we are doing our modest part in fulfilling the obligations of the electrical industry to the American farmer and we shall continue to support its worthy purpose.

Comment of Manufacturers

Sound and Steady Business Expected

IN THE electrical machinery line there was a moderate decrease in business in the latter part of 1927 as compared with the first half of the year, but it would seem as though we can look forward to the year 1928 with a fair degree of confidence. There is every reason to believe that the requirements of public utility corporations will not decrease. New uses and applications of electricity are constantly being made. The condition of the financial market offers favorable opportunities to provide the capital for necessary extensions. On the whole, it would not appear that the present slackening in business will be of extended duration, and while its immediate effect may be to reduce output and in many cases profits, there would seem to be reason to expect sound and steady business throughout 1928.

Otto H. Falk,
President Allis-Chalmers Manufacturing Company.

More Sales Predicted as Result of Surveys

IN 1926, the year in which the supply department of the Western Electric Company changed its name to Graybar, we realized a total business of $77,000,000, which was by far the largest volume we had ever attained up to that time. Our business this year, while somewhat under that volume, will run close to it. We estimate that business in 1928 will be somewhat better than it has been during 1927, and we look forward to a very satisfactory volume from every standpoint. This estimate is given not as an optimistic guess but rather as a figure which is based on a very close survey of business conditions of the present and future from all parts of the country.

All our sales and expense budgets are based on these estimates, and in the many years since we have adopted this plan of budgeting sales and expense it is very seldom that our estimates and accomplishments vary very much. This survey and statement, therefore, should be of interest to business and financial men of the country who are looking into the future with questioning eyes. It is our belief, based on our estimates, that we need have no fear about the business outcome for the year to come.

A. L. Salt,
President Graybar Electric Company, Inc.

Good Promise of Satisfactory Trade

THE volume of sales for 1927 exceeded our expectations and was very satisfactory indeed. Further, I believe the year in all branches returned a bigger and better business than was generally predicted. The year 1928 gives good promise for a satisfactory volume of trade. I am saying that we look for continued good business, and as mass psychology is most potent, the more people saying that business is good the better the possibility of attaining good business. So let us bury any pessimistic feelings and cry aloud our faith in conditions for the coming year. In doing so we shall all help ourselves.

F. C. Hodkinson,
Vice-President and General Manager American Circular Loom Company.

Prosperous Year Ahead for the Progressive

THE steadily increasing business of utilities at an adequate profit will be favorably reflected in an increased amount of business placed with manufacturers, and if they in turn are well managed and produce good quality at a fair price, they will be rewarded by fair profit. The interests of the utilities and the manufacturers are mutual. One cannot succeed without the other and the most promising feature of today's business is that those who today are not willing to let each branch of the industry prosper represent a constantly diminishing minority. Basing my opinion on the combination of a fair-minded, prosperous utility group, coupled with a natural increasing demand of the public for more and more electric service, I feel the well-managed manufacturing companies, performing a useful function, can look forward to a prosperous 1928.

H. W. Young,
President Delta-Star Electric Company.

Indicates Splendid Basic Condition

A REVIEW of the electrical industry indicates a splendid basic condition which not only gives promise of a continuation of prosperity but also gives promise of a reasonable increase in the volume of electrical business during the year 1928. With many millions of wired homes which are as yet inadequately equipped with labor-saving and convenient electrical appliances, there is a continually broadening market for these devices. During the past year in-

creased sales of all domestic appliances, with the exception of fans, have been recorded throughout the country. Adequate provision should be made for sufficient wiring in new buildings to permit the more liberal use of current-consuming devices.

During the past year there has been only a fair volume of business in the large generating and control apparatus used in the great public utility stations, probably owing to the larger individual units now being installed. The application of electric motors to all kinds of industrial needs has shown progress and has already reached very large dimensions. As this use is becoming almost universal, development of this field should continue at a rapid rate. Progress in the electrification of our railroads has been very much slower than was anticipated some months ago. A considerable increase in the volume of this business is looked for in the near future.

E. M. Herr,
President Westinghouse Electric & Manufacturing Company.

Good Prospects

ALTHOUGH competition was exceedingly keen, our 1927 business was highly satisfactory. Barring some abnormal conditions, 1928 should be equally good.

S. A. Burnham,
President Condit Electrical Manufacturing Corporation.

Expect 1928 Will Be Better Than 1927

OUR sales in 1927 slightly exceeded those of 1926, but the last half slowed up for two reasons—Ford's delay in getting out the new car and unseasonably warm weather. We expect 1928 to be better than 1927 for the same two causes, among others—Ford will be on the market and the auto trade humming, and second, the late fall helped the farmer, who will have more to spend. Other reasons for expecting 1928 to be a good business year include easy money, good employment at high wages and moderate inventories.

F. W. Jessop,
President Ohio Electric & Controller Company.

1928—A Buyers' Market With Price Reductions

OUR 1927 business for eleven months shows a 3 per cent increase over a similar period for 1926. Resale prices average a 5 per cent reduction over 1926, so this figures substantially an 8 per cent increase in commodity sales in 1927 over 1926. The year 1928 will, in my opinion, be a "buyers' market," with price reductions which naturally meet these conditions. The rather general allowance of 5 per cent cash discounts covering invoices paid on the 10th proximo as compared with cash discounts of 2 per cent paid ten days from date of invoice is an unfortunate condition and is to my mind an indication of unsound business conditions which is not as yet reflected by the money market.

G. E. Palmer,
President Palmer Electric & Manufacturing Company.

Next Year to Equal 1927

THE business volume in 1928 will be at least the equal of 1927 and possibly equal 1926. While our volume for the year 1927 was considerably greater than 1926, this is largely owing to the manufacture and distribution of new lines of product and not because business generally has been so good. Our business, which is an excellent barometer, does not indicate a "boom" year, as many have predicted. Money and credit conditions will probably remain easy for some months, but we believe will gradually stiffen. Foreign competition, especially in foreign markets, will be more apparent in 1928. Commodity prices have increased slightly, yet there are indications that we are in a gradual but definite declining commodity price cycle.

Living expenses are slowly but surely decreasing and eventually labor wages will follow. Considerable unemployment exists at the present time. Inventories are not large generally, but are large enough for any consumption that exists and we feel that those who claim that stocks must be replenished are not taking this fact into consideration, and also the gradual decline of purchasing power. Our business indicates that prices of raw materials and commodities are working toward a balanced condition—somewhere between 40 and 50 per cent above pre-war prices. The copper metal is a good illustration of this. It has been too low in price as compared with most raw materials. Other metals have been too high and out of balance and are declining in price. Agricultural products have been too low, but are working higher. The prices of most manufactured products have been too low as compared with the cost of raw material and labor. The balance, we believe, however, will be affected by reduction of costs rather than appreciable increase in prices.

E. B. Freeman,
Vice-President B. F. Sturtevant Company.

Outlook Encouraging

BUSINESS in 1927 was slightly off in volume as compared with 1926. The outlook for 1928, in my opinion, is very encouraging. The conditions, as I see them, seem to point toward a larger volume of business, and while prices will be very competitive, yet I think the results for the year will be satisfactory.

W. C. Bryant,
Chairman Bryant Electric Company.

Outlook for Wire Is Fairly Good

THE electrical wire and cable industry in 1927 has suffered from a somewhat reduced consumption and a highly competitive price situation. The outlook for 1928 business is fairly good and manufacturers should make a better showing than they have during 1927, provided a few of the manufacturers who have operated without reasonable profit in 1927 make a careful analysis of their actual manufacturing and selling costs and base their selling prices upon costs plus a reasonable profit rather than upon lowest competitive price as reported by the salesmen and probably made by some manufacturer without cost knowledge. Copper, rubber and yarn prices would indicate that present selling prices are exceedingly low and that as soon as business shows improvement in the coming year prices should show a reasonable advance.

H. T. Dyett,
President Rome Wire Company.

Better Sales and Profits Predicted

BUSINESS was not quite so good in 1927 as it was in 1926. There was much left to be desired, particularly as regards the margin of profit, but business was in fair volume and we look forward to 1928 with a great deal of confidence. I do not believe there will be any particular boom, but we shall have a better year than 1927, and also a better margin of profit.

Louis Larsen,
General Manager Sundh Electric Company, Inc.

Market for Refrigerators Continually Expanding

OUR 1927 experiences caused us to appreciate more fully than ever the permanent character of the demand for our products and demonstrate conclusively that 1928 and succeeding years will provide a continually expanding market for automatically operated electrical refrigeration.

A. H. Goss,
Chairman of the Board Electric Refrigeration Corporation.

Outlook Favorable

THE outlook for 1928 is, on the whole, favorable. Economic conditions are sound and the satisfaction of the demand of 120,000,000 people should provide ample business activities, with the usual attendant improvement in the art. Earnings of labor have never been so high and with a continuance of good business these earnings should continue and employment become steadier. The electrical manufacturing business for 1927 has, on the whole, been satisfactory, and about the same in volume as

the previous year. The use of electric current in homes and factories has increased 7 per cent over 1926, and with the exception of 1921 has shown an increase each year since 1919, when the index was first prepared, and the consumption in 1927 was more than double what it was in 1919. This is becoming one of the best indices of general and industrial conditions in America.

GERARD SWOPE,
President General Electric Company.

Sales Will Not Be Less Than in 1927

OUR business in 1927, while satisfactory, has been slightly under 1926. The first six months showed better sales than the corresponding period of 1926. The third quarter showed a decided slump. We had a fairly good sale during the last quarter, but taken as a whole our total sales for the year will show slightly under last year. We feel that the outlook for 1928, so far as we can judge, is good, at any rate not less than this year. We do not, however, feel that 1928 will be quite so good a year for the electrical business as 1926. R. C. LANPHIER,
President Sangamo Electric Company.

No Change in Business, Improvement Probable

IT IS my anticipation that no material change in the business conditions now prevailing will occur until the political situation and the crop situation for 1928 are more definitely determined. This may take the first half of the year. After that, assuming no unfavorable developments in either the political or the crop situations, I look for improvement.

B. WORDEN,
President Cutler-Hammer Manufacturing Company.

Business Activity Will Continue

THE increased volume of business, generally expected by electrical manufacturers for 1927, was reduced, no doubt, on account of the mid-year readjustments of budgets by public utilities and industrials. However, the electrical industry appears to have enjoyed during 1927 a business volume about equal to that of 1926—the industry's greatest previous business year. Indications at this time point to a continuance of the present rate of business activity during the first half of 1928.

N. J. CONRAD,
General Manager Schweitzer & Conrad, Inc.

Stable Market Looked For in 1928

IN 1927 the volume of business was slightly less than for 1926 and profits were not as satisfactory, owing principally to the unstable market conditions and great caution used by buyers during the last quarter of the year. These same facts obtained in most of the primary industries—that is, low profits and unsatisfactory volume. In the electrical industry the prices of apparatus are lower in proportion to costs than most any other manufactured article. This makes for keen competition and low profits. We look forward to the year 1928 with assurance. We believe prices will be better and volume substantially larger, and we believe in our industry the market will be more stable than it has been during the past two years.

EDMUND LANG,
President Crocker-Wheeler Electric Manufacturing Company.

Fair Demand for Poles Expected

OUR analysis of business conditions as it pertains to the pole industry is that 1927, from a standpoint of volume, has produced the largest pole business in the history of the industry, but with somewhat of an unsatisfactory price situation, especially for the last six months of the year. For 1928 we are looking for a fair demand, with some shrinkage from that of 1927. There will not be quite as much transmission line building in 1928, but the demand will be equally as heavy for distribution lines.

L. L. HILL.
President Page & Hill Company.

Large Volume Can be Created in 1928

WHILE I do not look for business secured during 1928 to equal that which might be the result of a boom period, I now entertain the opinion that business will be good during 1928 for those who will make a definite effort not only to secure their share but to create business where there are so many opportunities existing. Even should the new move to develop the market not get well under way during the next year, There will be a sufficient inspiration so the industry will witness substantial gains in 1928. R. J. RUSSELL,
Vice-President and Secretary Century Electric Company.

Profits Discouraging but Prospects Bright

THE volume of business in 1927 was very satisfactory, but from a profit standpoint it was a most discouraging year. Competition was very severe and apparently it was a "buyers' market" and full advantage was taken of this condition when purchasing materials. Prospects for 1928 do not indicate much change over 1927. This will mean that to make a reasonable profit it will be necessary to increase greatly the efficiency and output per man unless better prices can be secured. L. R. LEWIS,
President Electric Power Equipment Corporation.

Confidence in 1928

THE year 1927 has been a good year. The prospects for 1928 are equally good. If business has been a little "off" in some quarters, as it has been in the appliance field, it merely indicates a little fluctuation in the wavy line of business trend, the general level of which continues well above the poor business zone. If, as a result of present trends, we have to manufacture and merchandise more efficiently in order to stay in the race, that will be good both for business and the country. We can look forward to 1928 with confidence. The electrical industry should push forward with enthusiasm. It needs sustained enthusiasm directed by merchandising wisdom. For that industry, the outlook is bright. G. A. HUGHES,
President Edison Electric Appliance Company, Inc.

Improvement Expected in Business Policies

THE year 1927 should be a warning to all manufacturers that while declining prices and profits go there must be a limit. The past year should have been a more prosperous one, considering the volume of business. There are some indications in the air that 1928 will not be a repetition of 1927. Many manufacturers are beginning to realize that "mass production" is an economic fact and not a slogan. Like everything else, it can be carried too far

F. R. FISHBACK,
President Electric Controller & Manufacturing Company.

Increase Expected

THE year 1927 showed a very healthy increase in our gross business; in amount, approximately 20 per cent. Prices are very much more satisfactory than previously and on the whole we are thoroughly satisfied with our business for the past year. Every indication points to the same increase in 1928, and the number of pending negotiations indicate that this business will be placed earlier than in the past, so that our customary low spot in production during the first quarter of the year will be to a larger extent filled out.

B. W. KERR,
President Railway & Industrial Engineering Company.

Better Year Anticipated

IT HAS been the almost uniform experience of manufacturers supplying the power plant field that the volume of business for 1927 was not quite so good as that which was experienced in 1926. The falling off in volume, however, has been relatively slight and on the whole 1927 has been what might be called a normal or average year. Competition has been very keen and in some cases destructive. It looks as though 1928 would be better than the year just closed.

Money rates are low, basic commodity prices are down and inventories of every sort are at a low figure due to more careful buying and accurate control of stocks. All factors seem to point to a fine business year.

F. H. DANIELS,
President Riley Stoker Corporation.

Improvement Anticipated

THE electrical motor business for 1927 has been much disturbed by changes in sales policy by all of the motor manufacturers and the adoption of a system of discounts for different classes of customers, which has required considerable time on the part of the customers to digest. The new methods are now becoming well understood and complications are disappearing. These factors should lead to a considerable improvement in the business for the year 1928.

JAMES BURKE,
President Burke Electric Company.

Expresses Confidence in 1928 Business

WE ARE looking forward with confidence to as good if not better business in 1928 than in the current year. Manufacturers devoting their efforts to quality products and rendering a prompt service should reap an increased business in the next twelve months.

L. G. KUHLMAN,
Treasurer and General Manager Wadsworth Electric Manufacturing Company, Inc.

Cross-Arm Sales Will Be in Good Volume

WE CANNOT see much difference between the business of the present time and that of one year ago. The indications as we see them are for sufficient volume during the coming year, but prices are not what they should be for the volume of business handled. The price of fir cross-arms is generally governed by the price of fir lumber. However, the building program indicates an increase and if this actually develops, then we look for somewhat better prices for cross-arms than have prevailed during the present year, which have been on a minimum basis.

B. F. VREELAND,
President Douglas Fir Cross-Arm Company.

Prosperity Dependent on Ourselves

I AM NOT a statistician and know only what the financial agencies tell me—that 1928 will be better than 1927, which was pretty-fair, that building will increase, which will help. But I can't get it out of my head that although an increase in general business will react to the advantage of the electrical industry, nevertheless the real extent of our prosperity is dependent upon ourselves. The people of this country have plenty of money. Whether or not they change their habits and give the electrical industry its fair share of what they spend is up to us. They won't do it unless we pound home the electrical idea. So, as far as our prosperity is concerned, we can write our own ticket for 1928.

W. E. SPRACKLING,
President Tubular Woven Fabric Company.

No Reason to Expect a Falling Off

WHILE naturally data for 1927 are not complete, the business of our company for the past year has run very close to that of 1926. While it will probably be found to be slightly below 1926 business, this falling off will not amount to more than 4 per cent, and as 1926 was by far the best year since the war, we feel that 1927 has been entirely satisfactory. As to the coming year, we see no reason for expecting a decided falling off, although probably there will not be much improvement. In other words, we expect 1928 to be about in line with 1927.

C. R. DURLING,
President Monitor Controller Company.

Better Business but Low Profits

GENERAL business in 1928 will be better than in 1927. There is a slight tendency toward increasing prices in raw materials which will counteract the otherwise gradually lowering cost of manufacture, the result probably being a stabilization of price, with a comparatively low margin of profit on standardized articles.

C. H. ROTH,
President Roth Brothers & Company.

Indications Good for Early 1928

IT IS a very difficult problem to give you our outlook on the prospects for business for 1928, and it must of necessity be more or less of a guess, but our business has been increasing in volume for the last six weeks and indications for the early part of 1928 seem especially good. We are planning for a considerable increase in volume over 1927.

J. A. JOHNSON,
Secretary-Treasurer Kuhlman Electric Co.

Keener Competition Is Forecast

THE competitive conditions of 1927 have stimulated manufacturers to improve their product and reduce costs, with the result that those who have been able to do so have maintained a substantial volume and a reasonable margin of profit. The same conditions for 1928 will undoubtedly prevail, with even keener competition and narrower margins, in my opinion. This is not altogether unhealthy, for it puts a premium on ability and a penalty on inefficiency, which is an old law. We must get used to a reasonable volume and make profits by closer attention to business.

H. G. STEELE,
President U. S. Electrical Manufacturing Company.

1927 Corn Crop Encouraging

THE effect of the large 1927 corn crop in the Southwest constitutes the most encouraging factor in current business and in the outlook for the early part of next year. Business for the current year in volume measures up very closely to 1926.

F. M. BERNARDIN,
Chairman of the Board Mid-West General Electric Supply Company.

Keen Competition but Satisfactory Business

WE LOOK for generally satisfactory business in the coming year, comparable to that we have had over the past two years. Competition is, of course, keen and there is every inducement for more efficient methods in production and distribution.

J. M. TAYLOR,
President Diamond State Fibre Company.

Expects Larger Volume

THE portion of our business done with the electrical trade was not so good in 1927 as in 1926. The fiscal volume was about 15 per cent less and the price levels about 10 per cent lower, which taken together produced an unsatisfactory result. We have a feeling that 1928 will show a considerable improvement in volume, since we believe the large utilities will soon come into the market with heavier specifications.

N. A. WOLCOTT,
President Packard Electric Company.

Can Expect Continued Prosperity

WE SEE no reason to expect anything but continued prosperity in the new year for the electrical business in all its activities. We are closing our banner year. The demand for lighting equipment, designed and built with the quality idea, always in mind, continues unabated from all directions.

AUGUSTUS D. CURTIS,
President Curtis Lighting, Inc.

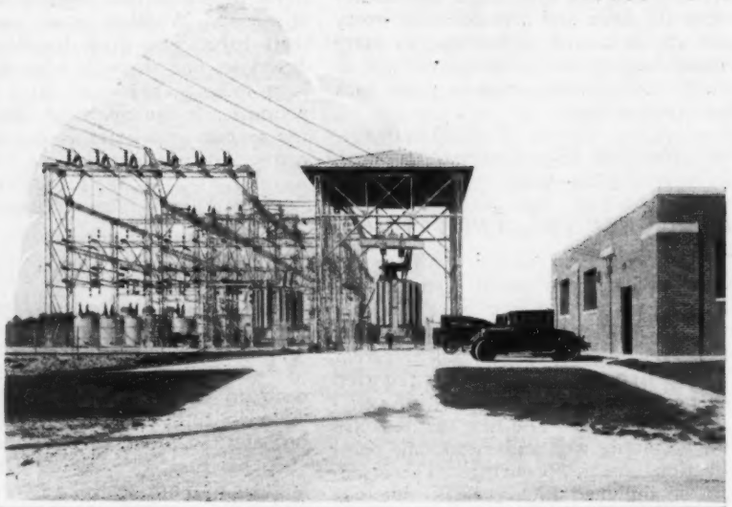
Prosperity Depends on Disposal of Problems

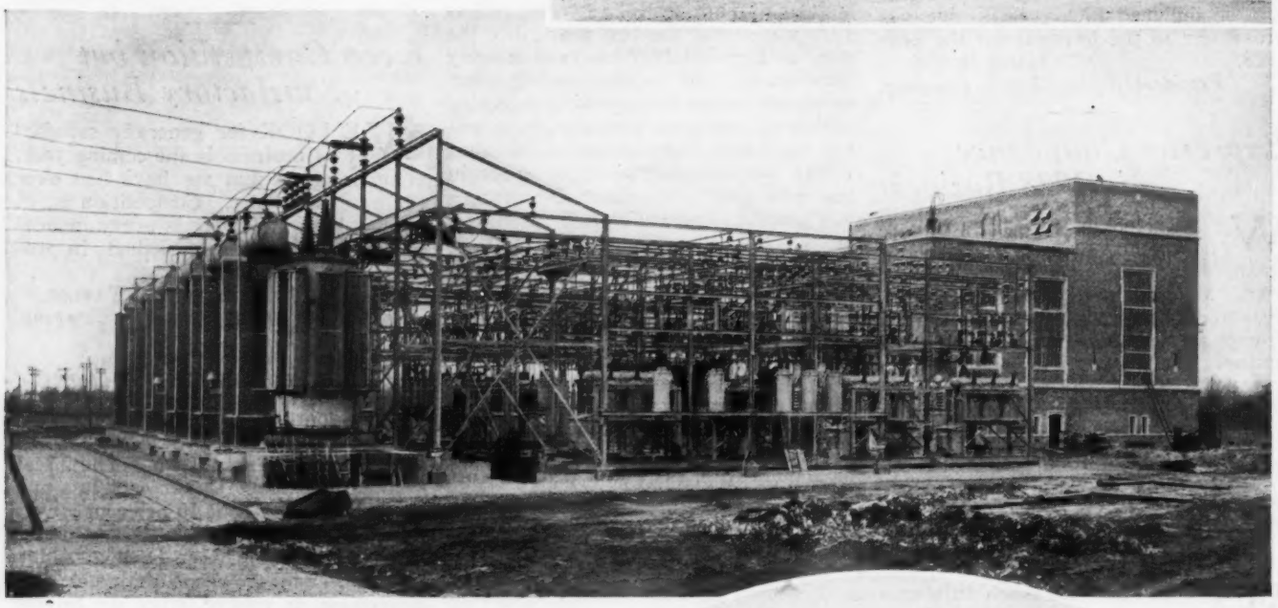
THE sooner we tackle and dispose of certain industry problems, prominent among them being the grounding problem, the greater will be the prosperity of the electrical industry in 1928 and every year thereafter.

D. H. MURPHY,
President Wiremold Company.

Substations of 1927

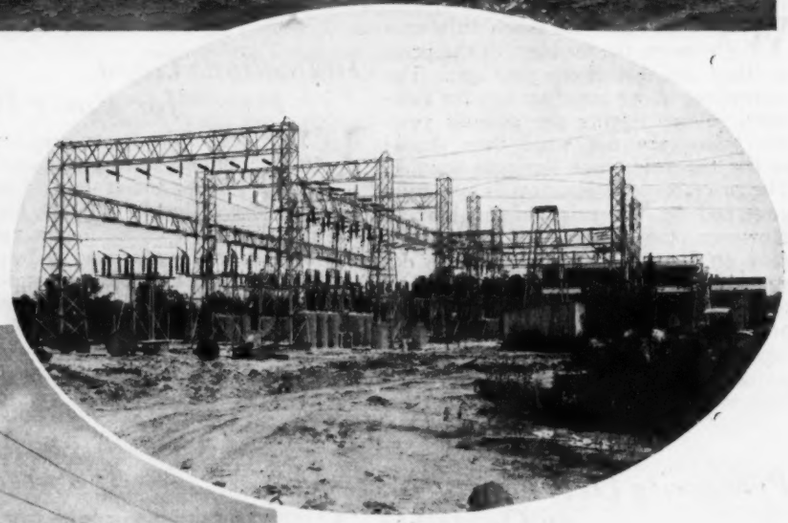
Notable Either for Construction or Purpose Used

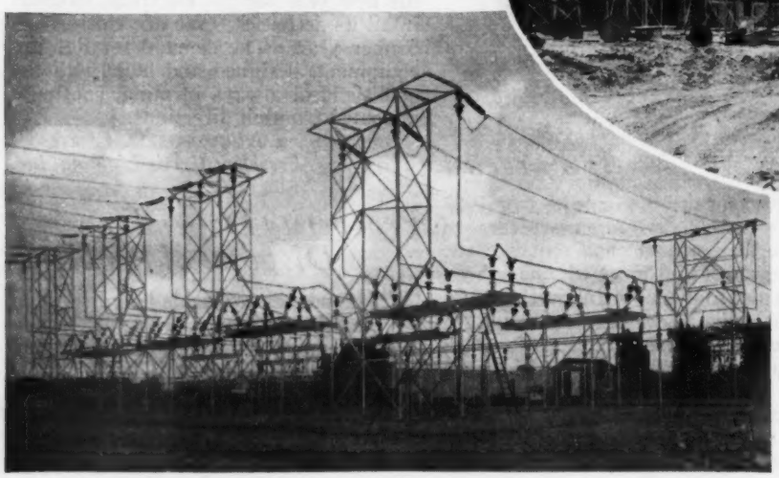




At top — Walpole, Mass., 110-kv. substation of the Edison Electric Illuminating Company of Boston, containing two 110/14-kv., 15,000-kva. transformers which will ultimately be attached to a transmission ring which has already been built from Edgar station through important centers to the south and west.

At bottom—Jackson 110-kv. substation of the Mississippi Power & Light Co.





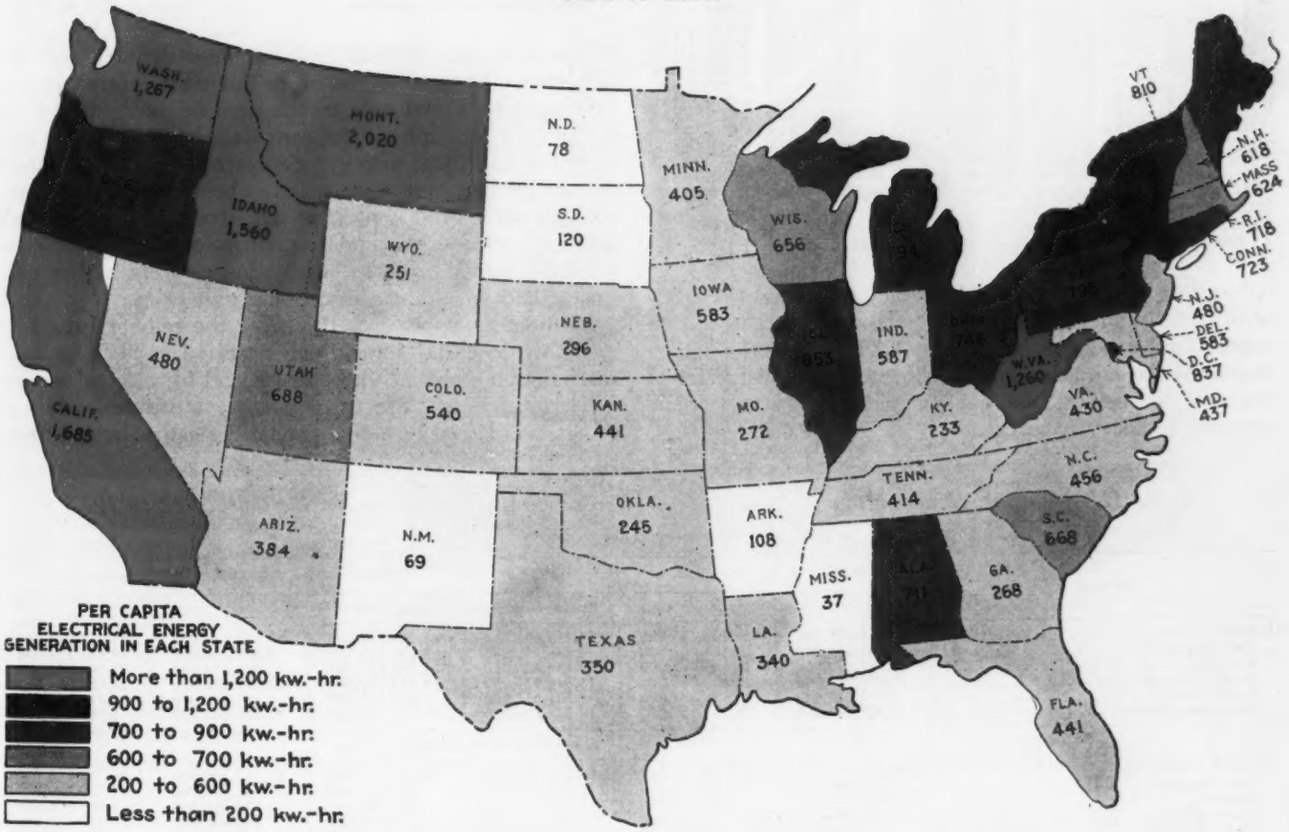
In center—Trenton 132-kv. switching station, which connects the New Jersey Electric & Gas Company with the Philadelphia Electric Company.

In oval—East Point substation of the Georgia Power Company, tied with Georgia and Alabama system by four 110-kv. lines and with Macon by two 60-kv. lines.

Light and Power Progress

Serves 21,700,000 customers for a gross revenue of $1,783,000,000. Generation aggregates 75,100,000,000 kw.-hr. Serves 16,000,000 hp. in factories. Résumé of operations

By G. F. Wittig
Statistical Editor



THE YEAR 1927 has witnessed a normal growth and development in the light and power industry. Its operations continue to expand, its service continues to supply an increasing demand and its management continues to develop better ways of doing business.

The 4,400 operating properties supply electricity to 21,700,000 customers in the United States. For this service they receive a gross revenue of $1,783,000,000. Operating and maintenance expenses used $767,000,000 of the revenue, taxes to local, state and national governments accounted for a sum estimated to be $150,000,000, and the balance of the revenue took care of incidentals, development expense, depreciation and obsolescence, and the credit requirements of an industry group whose operating and holding company capitalization aggregates $9,500,000,000. In 1927 the light and power utilities raised more than $2,100,000,000 in the money markets which they used for refunding high-rate issues and for additions to service facilities. Of this sum, $240,000,000 was raised by direct sales of securities to customers and employees in 344,000 individual sales. The capital expenditures for these properties aggregated $760,000,000 in 1927, and the budget for 1928 amounts to $900,000,000.

In their normal operations the light and power companies generated 75,100,000,000 kw.-hr., of which 29,000,000,000 kw.-hr. came from waterpower plants and 46,100,000,000 kw.-hr. from fuel-burning stations. The generating capacity of the industry aggregates 29,000,000 kva.; of the prime movers water power operates 11,700,000 hp. This power supplied nearly 16,000,000 of the 35,800,000 hp. driving our factories, to quote 1925 census figures, and it gave to the cities and homes the services and conveniences which only electricity can render.

Economy Due to Management

But along with these results, many developments occurred in the industry which were of fundamental importance to industry growth. Executives are trying to sell more service. They are attempting to use mass production and consolidated management, to reduce costs so that more and better service may be rendered for the same money. As a consequence, mergers and corporate changes occurred which were more than 800 in number, generating station efficiencies were improved through the display of engineering talent, the cost of money was

Table I—Distribution of Central-Station Energy, 1913-1927

(100 per cent of the industry)

Year	Energy Generated* (Millions of Kw.-Hr.)	Net Energy Imported‡ (Millions of Kw.-Hr.)	Total Energy Generated and Imported (Millions of Kw.-Hr.)	Estimated Net Consumption by Customers (Millions of Kw.-Hr.)				Line Losses and Intra-Company Business (Millions of Kw.-Hr.)
				Total	Lighting	Power	Railways	
1913	13,000	700	13,700	10,860	2,960	4,600	3,300	2,840
1914	14,400	773	15,173	12,030	3,100	5,580	3,350	3,143
1915	16,175	656	16,831	13,551	3,241	6,310	4,000	3,280
1916	21,230	1,022	22,252	17,897	3,807	9,990	4,100	4,355
1917	25,438	1,225	26,663	21,490	4,530	12,560	4,400	5,140
1918	29,200	1,129	30,329	24,300	5,400	14,400	4,500	6,029
1919	34,900	1,143	36,043	29,000	6,460	17,890	4,650	7,043
1920	39,519	950	40,469	32,630	7,850	19,960	4,820	7,839
1921	36,971	1,020	37,991	30,700	8,700	17,400	4,600	7,291
1922	43,560	862	44,422	35,822	9,560	20,620	5,642	8,600
1923	51,133	1,055	52,188	42,220	11,410	24,810	6,000	9,968
1924	54,413	1,400	55,813	45,000	12,990	25,810	6,200	10,813
1925	61,159	1,239	62,398	50,221	13,790	30,130	6,301	12,177
1926	69,158	1,506	70,664	56,964	15,000	35,154	6,810	13,700
1927†	75,116	1,650	76,766	62,136	16,300	38,486	7,350	14,630

* 1920–1927 as collected by U. S. Geological Survey.
† Based on ten months' operations. ‡ From Canada Year Book.

reduced by the use of low-rate money incidental to better utility credit, and operating methods were reorganized to lower costs of doing business. All these developments displayed the initiative and intelligence of industry leaders and lie behind the cold statistical figures, which measure industry progress.

Table II—Sources of Central-Station Gross Income, 1921 to 1927

(100 per cent of the industry)

Year	Total Gross Income	Received from Lighting Customers	Received from Power Customers	Received from Electric Railways	Received from Other Public Utilities
1921	$944,400,000	$570,500,000	$267,800,000	$44,650,000	$61,450,000
1922	1,072,119,883	657,119,883	303,200,000	50,750,000	61,050,000
1923	1,269,550,000	795,000,000	358,150,000	52,200,000	64,200,000
1924	1,354,570,000	902,670,000	321,000,000	54,400,000	76,500,000
1925	1,480,500,000	979,500,000	367,540,000	53,270,000	80,190,000
1926	1,652,300,000	1,018,200,000	461,000,000	58,100,000	115,000,000
1927†	1,783,700,000	1,075,800,000	517,900,000	60,600,000	129,400,000

† Based on ten months' operation.

Statistics are of little value unless defined and interpreted. Each user will draw his own inferences regarding details, and only trends need be discussed. One theme runs through all the compilations, and that is the fact that electrical energy, generated in large stations and distributed over wide areas, is being used in increasing amount in the homes, in industry and in the other pursuits incidental to modern civilization. This electrical energy is being produced with progressively higher efficiency, and is sold at a decreasing unit price.

Without attempting to penetrate the remote future, it seems evident that for as long a period as need be considered, in a practical way, the demand for electric service will continue and the turn toward saturation, when it comes, will be very gradual. That rise is predicated upon

Table III—Output, Revenue and Expense of the Central-Station Industry by Sections, 1922 to 1927

(100 per cent of the industry)

Section	1922	1923	1924	1925	1926	1927†
	Energy Generated, Kilowatt-Hours +*					
United States	43,559,677,000	51,132,883,000	54,413,403,000	61,158,857,000	69,158,114,000	75,116,078,000
New England	3,160,550,000	3,664,602,000	3,748,536,000	4,236,675,000	4,612,732,000	4,983,173,000
Atlantic	15,709,032,000	18,695,901,000	19,694,478,000	21,880,778,000	25,006,632,000	27,086,021,000
North Central	13,436,664,000	15,614,068,000	16,644,922,000	18,913,784,000	21,277,628,000	22,606,564,000
South Central	2,826,224,000	3,380,984,000	3,791,011,000	4,607,650,000	5,491,028,000	6,713,755,000
Mountain-Pacific	8,427,207,000	9,777,328,000	10,534,456,000	11,519,970,000	12,770,094,000	13,726,565,000
	Gross Revenue from Sale of Energy					
United States	$1,072,119,883	$1,269,550,000	$1,354,570,000	$1,480,500,000	$1,652,300,000	$1,783,700,000
New England	103,885,016	120,200,900	126,655,000	141,200,000	153,600,000	163,800,000
Atlantic	387,811,179	476,500,000	507,155,000	557,400,000	631,500,000	684,000,000
North Central	358,079,391	418,350,000	445,150,000	470,000,000	515,800,000	547,000,000
South Central	76,134,431	103,000,000	105,610,000	128,800,000	150,500,000	174,200,000
Mountain-Pacific	146,209,866	151,500,000	170,000,000	183,100,000	200,900,000	214,700,000
	Operating and Maintenance Expenses‡					
United States	$481,570,000	$576,880,000	$617,980,000	$650,000,000	$723,000,000	$766,700,000
New England	50,000,000	57,600,000	58,286,000	61,100,000	64,000,000	71,300,000
Atlantic	175,800,000	219,000,000	221,320,000	252,500,000	266,100,000	279,000,000
North Central	171,300,000	202,000,000	214,094,000	220,300,000	247,000,000	251,000,000
South Central	34,200,000	46,100,000	50,750,000	53,000,000	72,000,000	79,100,000
Mountain-Pacific	50,270,000	52,180,000	73,530,000	63,100,000	73,900,000	86,300,000

* Data collected by U. S. Geological Survey. † Based on ten months' operations. ‡ Do not include interest, taxes, depreciation or sinking fund. + Does not include imported energy.

*Table IV—Output of Central-Station Hydro and Fuel Power Plants, 1925-1927**

(100 per cent of the industry)

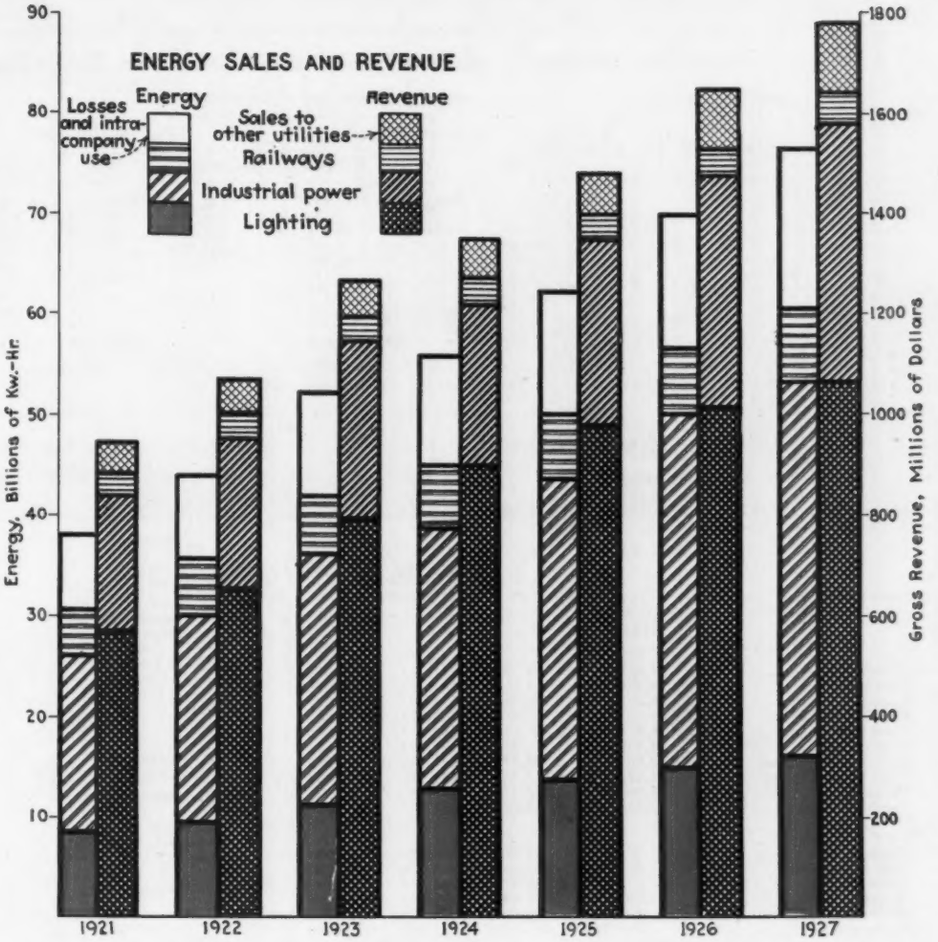
Section	Energy Generated During 1925				Energy Generated During 1926				Energy Generated During 1927†			
	Hydro Plants		Fuel Power Plants		Hydro Plants		Fuel Power Plants		Hydro Plants		Fuel Power Plants	
	Thousands of Kw.-Hr.	Per Cent of Total	Thousands of Kw.-Hr.	Per Cent of Total	Thousands of Kw.-Hr.	Per Cent of Total	Thousands of Kw.-Hr.	Per Cent of Total	Thousands of Kw.-Hr.	Per Cent of Total	Thousands of Kw.-Hr.	Per Cent of Total
United States	21,996,547	35.9	39,162,310	64.1	25,833,603	37.4	43,324,511	62.6	29,041,778	38.7	46,074,300	61.3
New England	1,587,141	37.6	2,649,534	62.4	1,668,339	36.1	2,944,393	63.9	1,862,739	37.4	3,120,434	62.6
Middle Atlantic	5,026,384	31.9	10,734,846	68.1	5,900,250	33.0	12,052,611	67.0	6,021,985	32.2	12,689,165	67.8
South Atlantic	1,667,075	27.2	4,452,473	72.8	2,086,872	29.5	4,966,899	70.5	2,575,351	30.7	5,799,520	69.3
East North Central	1,565,230	10.5	13,465,147	89.5	2,000,146	11.7	15,060,279	88.3	2,295,462	12.7	15,766,957	87.3
West North Central	1,276,649	32.9	2,606,758	67.1	1,473,634	35.0	2,743,569	65.0	1,638,694	36.0	2,905,451	64.0
East South Central	1,024,437	40.1	1,517,398	59.9	1,925,679	64.6	1,051,829	35.4	2,302,248	67.0	1,132,844	33.0
West South Central	30,491	1.4	2,035,324	98.6	48,876	1.9	2,464,644	98.1	76,252	2.4	3,202,411	98.6
Mountain	2,548,844	84.6	460,564	15.4	2,754,695	83.6	536,002	15.4	2,951,944	87.2	436,453	12.8
Pacific	7,270,296	85.4	1,240,266	14.6	7,975,112	84.1	1,504,285	15.9	9,317,103	90.1	1,021,065	9.9

* Data collected by U. S. Geological Survey. † Based on ten months' operations.

something more substantial than the upward sweep of a curve on a chart. The fundamental difference between life in the twentieth century and in former ages is the general use of mechanical in place of human or animal power. This, probably more than any other one factor, has served to create the wealth that nurtured the other contributions to our well-being and comfort.

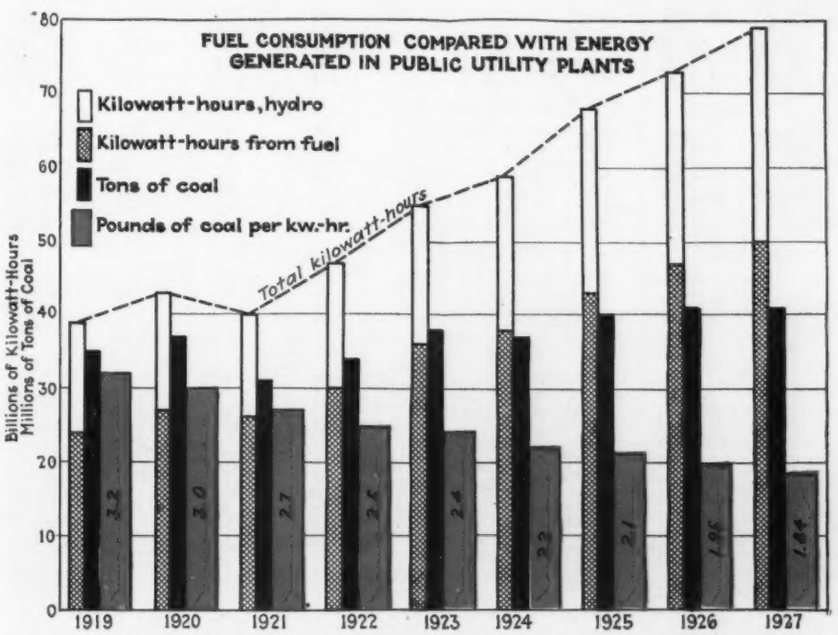
Electricity Aids Industry

The most convenient and versatile agency thus far discovered for the transmission and application of that mechanical energy is the electrical system. The statement is made in no disparagement or lack of recognition of non-electrical uses of power. The tractor-hauled gang plow and the garden spade each has its place in tilling the soil. Electrical methods will supplant non-electrical wherever they fill a real need and their advantages are adequately presented. On these basic considerations rests the future advance of the electrical industry.



LIGHTING ACCOUNTS FOR $1,100,000,000 OF GROSS REVENUE

Since 1921, the generation of energy in public utility plants has increased at an average rate of nearly 7,000,000,000 kw.-hr. annually. To provide the machinery for generating that increase calls, each year, for a net addition of 2,500,000 to 3,000,000 kva. with the necessary prime movers, plus replacement for what has become obsolete. To send out and apply the added 7,000,000,000 kw.-hr. necessitates transmission and distribution equipment and energy-converting devices with their accessories. To buy and install the power companies' part of all this material calls for about $800,000,000 to $900,000,000, in capital investment annually.



LESS COAL IS USED PER KILOWATT-HOUR EACH YEAR, GIVING DOUBLE THE ENERGY WITH ONE-SIXTH MORE FUEL

Compared with 1926, business in 1927 was slower in the electric as in other industries. But, whereas in many of the others this signifies a recession in operations and in earnings, in the electric power industry it means something very different. The earnings in 1927 were greater than in the year before by more than $131,000,000, or 8 per cent, and the output was greater by 6,000,000,000 kw.-hr., nearly 9 per cent increase. Only the increase, not the operations themselves, was less than in 1926, which showed $168,000,000 rise in the revenue and 8,000,000,000 kw.-hr. increase in energy generated over the preceding year's operations.

It has been suggested that 1928 may show a decline in new construction. The indications are contrary to that view. The summary of prospective budgets, based this year on an exceptionally full response to requests for that information, is higher than

*Table V—Consumption of Fuel by Central-Station Steam Power Plants, 1925-1927**

(100 per cent of the industry)

Section	Coal (Short Tons)			Fuel Oil (Barrels)			Gas (Thousands of Cubic Feet)		
	1925	1926	1927†	1925	1926	1927†	1925	1926	1927†
United States	35,321,502	36,594,540	37,442,120	9,742,238	8,970,356	6,409,635	45,479,189	52,160,061	65,465,314
New England	2,195,537	2,244,611	2,283,538	916,527	908,134	875,961	0	0	0
Middle Atlantic	9,766,271	10,408,642	10,297,588	223,287	242,615	284,013	226,749	147,330	122,968
South Atlantic	3,860,880	4,052,005	4,607,219	1,683,005	2,253,275	1,975,559	576,673	157,302	149,801
East North Central	13,499,767	14,165,281	13,887,730	55,171	47,654	54,898	6,539,399	5,079,733	5,938,090
West North Central	3,116,778	3,026,389	3,173,067	1,113,513	963,861	792,742	5,267,705	5,799,649	9,725,726
East South Central	1,641,802	1,226,151	1,295,606	148,255	62,703	58,481	26,400	18,261	2,410
West South Central	555,814	837,208	1,367,899	3,019,883	1,693,561	946,544	22,345,800	30,430,507	41,153,490
Mountain	623,229	620,320	522,759	210,271	239,195	219,505	146,395	160,769	523,078
Pacific	62,424	13,933	6,714	2,372,326	2,559,358	1,202,832	10,350,048	10,366,510	7,849,751

* Data collected by U. S. Geological Survey. † Based on ten months' operations.

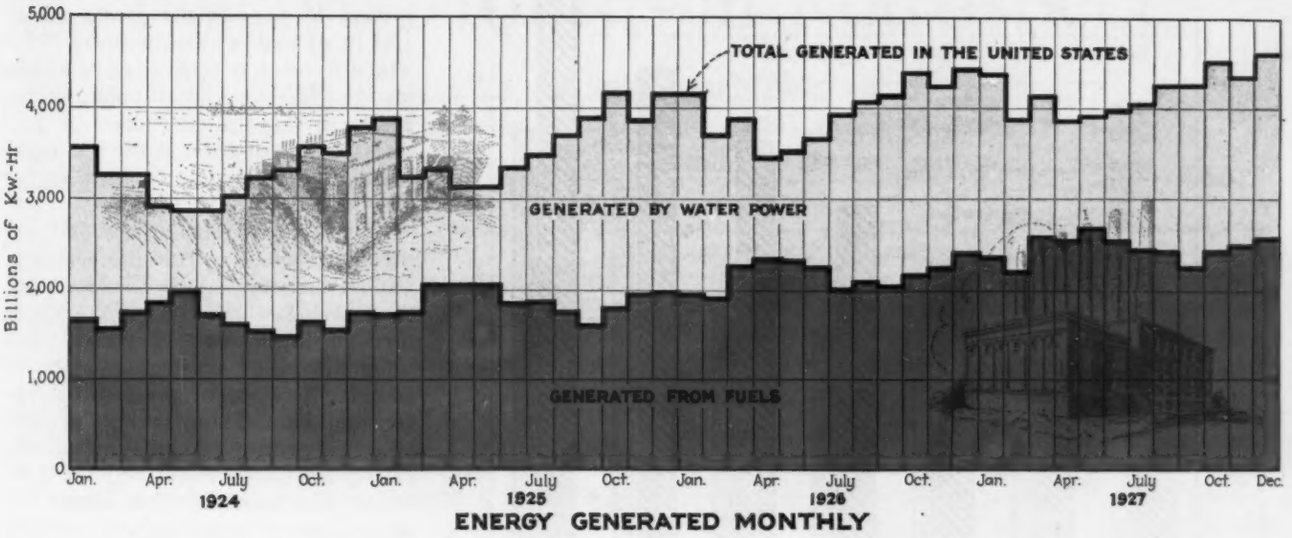
Table VI—Electrical Energy Generated in Central Station, Railway and Other Utility Plants

Figures for 1924, 1925 and 1926 are based on U. S. Geological Survey data, and 1927 figures are based on ten months' operation.

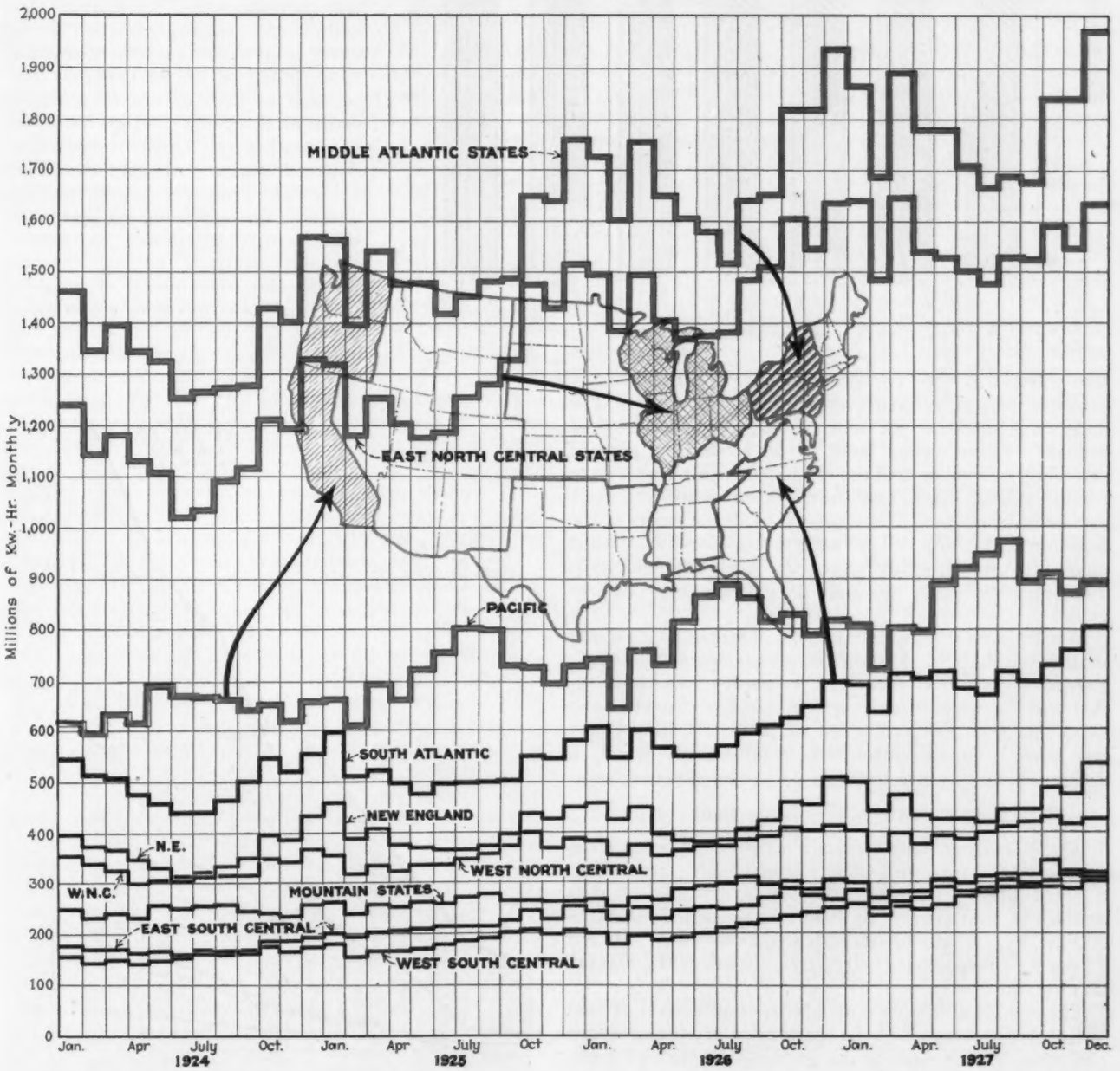
State and Section	Electrical Energy Generated (Thousands of Kilowatt-Hours)			
	1924	1925	1926	1927
United States	59,013,590	65,870,306	73,791,064	79,588,000
New England	4,334,553	4,823,655	5,165,955	5,499,000
Middle Atlantic	16,305,735	18,298,853	20,526,802	21,339,000
East North Central	13,791,109	15,714,972	17,663,578	18,612,000
West North Central	3,934,166	4,253,656	4,586,814	4,813,000
South Atlantic	5,949,906	6,271,770	7,197,294	8,542,000
East South Central	2,063,570	2,609,746	3,049,199	3,512,000
West South Central	1,923,075	2,201,833	2,639,520	3,342,000
Mountain	2,963,081	3,127,142	3,424,715	3,534,000
Pacific	7,748,395	8,568,679	9,537,187	10,395,000
New England				
Maine	473,671	509,231	544,423	580,000
New Hampshire	215,806	263,683	263,524	282,000
Vermont	223,793	257,974	264,914	285,000
Massachusetts	2,097,998	2,377,649	2,498,915	2,656,000
Rhode Island	427,493	408,208	476,239	508,000
Connecticut	895,792	1,006,910	1,117,940	1,188,000
Middle Atlantic				
New York	9,288,569	10,266,700	11,332,507	11,783,000
New Jersey	1,304,297	1,506,155	1,736,881	1,803,000
Pennsylvania	5,712,869	6,525,998	7,457,414	7,753,000
East North Central				
Ohio	3,701,562	4,387,499	4,761,028	5,018,000
Indiana	1,297,676	1,484,472	1,758,435	1,850,000
Illinois	4,665,472	5,269,477	5,930,399	6,247,000
Michigan	2,696,648	3,031,273	3,392,813	3,578,000
Wisconsin	1,429,751	1,542,251	1,820,903	1,919,000
West North Central				
Minnesota	869,866	1,045,684	1,040,191	1,090,000
Iowa	1,175,068	1,195,315	1,344,978	1,411,000
Missouri	888,755	865,802	912,503	957,000
North Dakota	39,296	39,050	47,555	50,000
South Dakota	65,909	74,875	80,342	84,000
Nebraska	337,902	366,266	394,832	414,000
Kansas	557,370	666,664	766,413	806,000
South Atlantic				
Delaware	87,977	102,100	118,866	141,000
Maryland	482,346	572,651	587,989	699,000
Dist. of Columbia	315,227	349,803	381,373	454,000
Virginia	743,668	801,568	925,882	1,099,000
West Virginia	1,762,737	1,642,894	1,807,360	2,143,000
North Carolina	647,330	942,294	1,117,378	1,324,000
South Carolina	943,577	881,536	1,038,198	1,232,000
Georgia	748,756	660,790	710,578	845,000
Florida	218,288	318,134	509,670	605,000
East South Central				
Kentucky	405,194	474,745	513,800	592,000
Tennessee	694,073	874,973	894,015	1,030,000
Alabama	890,087	1,169,101	1,582,717	1,822,000
Mississippi	74,216	90,927	58,667	67,000
West South Central				
Arkansas	154,682	189,070	163,697	207,000
Louisiana	308,262	350,322	519,793	657,000
Oklahoma	331,157	394,383	463,128	586,000
Texas	1,128,974	1,268,058	1,492,902	1,892,000
Mountain				
Montana	1,145,285	1,262,629	1,407,903	1,454,000
Idaho	792,532	754,079	810,789	836,000
Wyoming	53,556	55,544	59,381	61,000
Colorado	490,030	522,892	561,962	581,000
New Mexico	19,913	21,787	25,993	27,000
Arizona	153,196	130,541	172,243	177,000
Utah	266,946	339,967	349,604	361,000
Nevada	41,623	39,703	36,840	37,000
Pacific				
Washington	1,503,560	1,623,007	1,807,792	1,980,000
Oregon	678,395	729,859	831,135	905,000
California	5,566,440	6,215,813	6,898,260	7,510,000

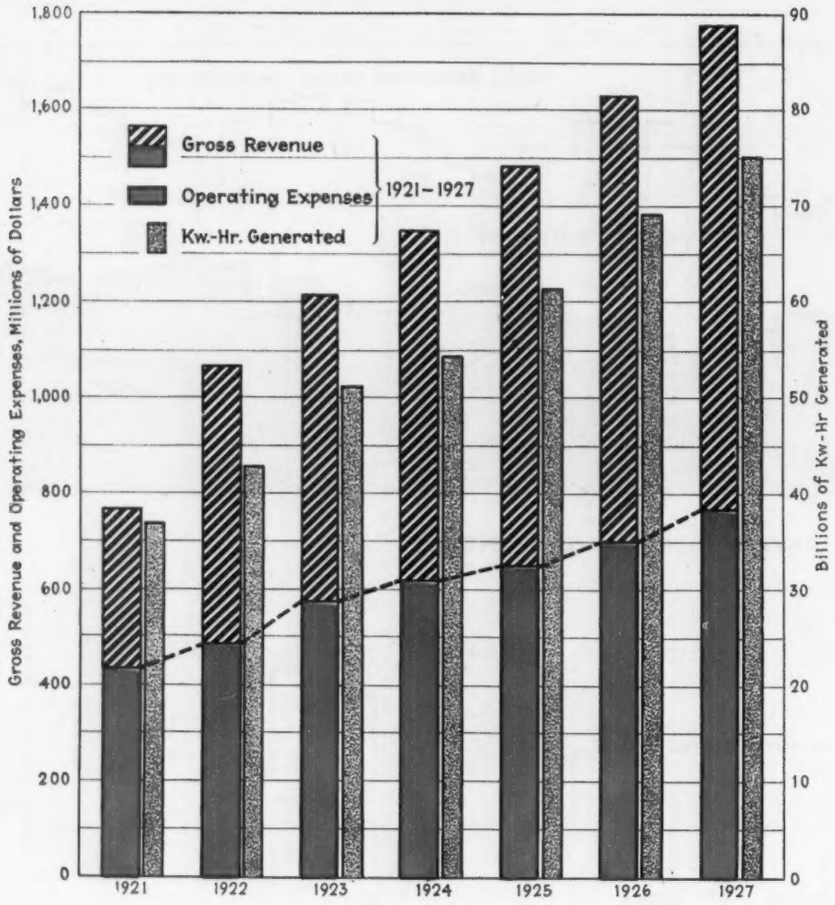
Table VII—Number of Central-Station Operating Systems and Installed Generator Rating, Dec. 31, 1927

State	Operating Companies			Generator Rating Kva.
	Total Number	Commercial	Municipal Systems	
United States	4,409	2,537	1,872	28,990,000
New England	330	259	71	2,410,000
Middle Atlantic	420	316	104	6,930,000
South Atlantic	529	296	233	3,620,000
East North Central	926	500	426	7,020,000
West North Central	1,064	420	644	2,050,000
East South Central	239	150	89	1,400,000
West South Central	441	271	170	1,150,000
Mountain	283	190	93	1,060,000
Pacific	177	135	42	3,350,000
New England				
Maine	65	59	6	250,000
New Hampshire	42	37	5	123,000
Vermont	58	46	12	124,000
Massachusetts	122	80	42	1,170,000
Rhode Island	9	9	0	222,000
Connecticut	34	28	6	521,000
Middle Atlantic				
New York	185	138	47	3,821,000
New Jersey	31	18	13	588,000
Pennsylvania	204	160	44	2,521,000
South Atlantic				
Delaware	8	3	5	59,800
Maryland	35	27	8	296,000
District of Columbia	3	3	0	192,100
Virginia	59	44	15	467,000
West Virginia	46	46	0	907,000
North Carolina	106	58	48	561,100
South Carolina	59	35	24	524,000
Georgia	137	44	93	357,000
Florida	76	36	40	256,000
East North Central				
Ohio	243	131	112	1,893,000
Indiana	161	81	80	701,000
Illinois	205	124	81	2,351,000
Michigan	145	73	72	1,351,000
Wisconsin	172	91	81	724,000
West North Central				
Minnesota	184	62	122	466,000
Iowa	158	68	90	602,000
Missouri	148	91	57	407,000
North Dakota	106	75	31	21,200
South Dakota	79	36	43	35,800
Nebraska	193	45	148	176,000
Kansas	196	43	153	342,000
East South Central				
Kentucky	74	60	14	231,000
Tennessee	62	43	19	412,000
Alabama	56	28	24	730,000
Mississippi	47	19	28	27,000
West South Central				
Arkansas	58	40	18	71,500
Louisiana	69	30	39	226,200
Oklahoma	135	62	73	202,100
Texas	179	139	40	650,200
Mountain				
Montana	37	34	3	431,000
Idaho	48	29	19	254,000
Wyoming	33	20	13	17,200
Colorado	64	37	27	170,000
New Mexico	23	22	1	7,800
Arizona	28	22	6	52,500
Utah	35	13	22	116,300
Nevada	15	13	2	11,200
Pacific				
Washington	66	55	11	636,000
Oregon	34	27	7	294,000
California	77	53	24	2,420,000



ENERGY GENERATED MONTHLY





ANNUAL INCREASE FOR FIVE YEARS AVERAGES MORE THAN $140,000,000 IN REVENUE AND 6,500,000,000 KW.-HR. IN OUTPUT

the expenditures for any previous year and exceeds any previous budget estimate, except that for 1927. The latter was made at the end of two years of unusual growth. There seemed need of an accelerated pace in providing new plant, and the estimated expenditures were correspondingly high; later developments justified a more conservative policy. The contrary condition exists at the beginning of 1928. The natural tendency is toward moderation in the estimates but the work deferred from 1927 must be made up, and the industry continues to grow.

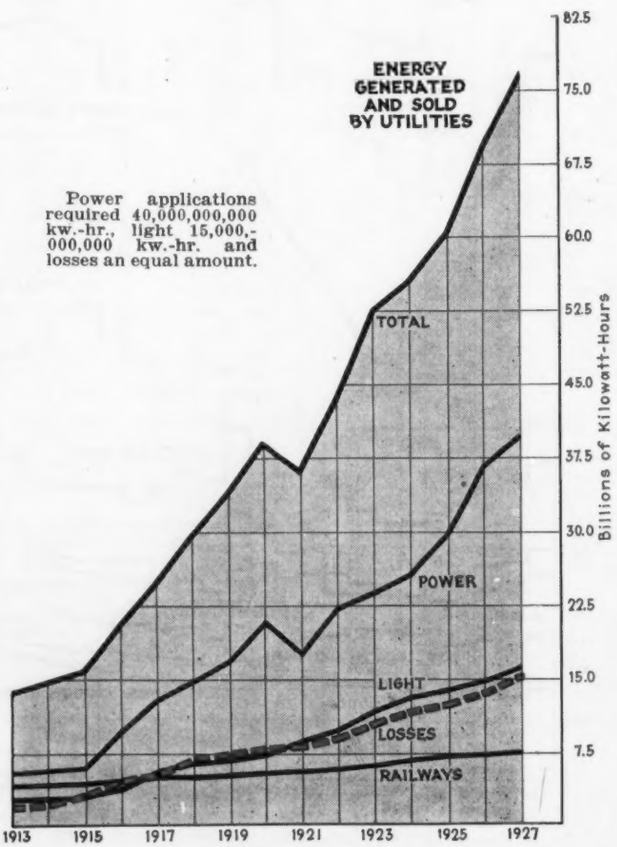
Whatever excess capacity may be indicated by a slightly smaller output per kva. shown in certain reports for 1927, compared with 1926, is at most temporary. Even 1,000,000 kva. represents only a few months' growth, and programs for new plant must be made not for months but years. Undue curtailment would surely result in embarrassment before the deficiency could be overcome.

Interconnection and Energy Production

The increasing sale of energy between operating companies reflects the effect of interconnections. In amount it constitutes a fifth of the total generated. It has doubled in four years. In 1923 it was about 7,400,000,000 kw.-hr. It rose in successive years by 12, 17, 36 and 12 per cent respectively. In 1927 it reached 14,700,000,000 kw.-hr.

The combined influence of improved utilization of fuel in the modern station, of the complementary use of hydro and steam power, and of the growing network of high-tension lines permitting the most advantageous allocation of loads in a wide area, is made evident by the decrease from 3.2 to 1.85 lb. of coal per kw.-hr. since 1919. The difference is equivalent to a saving, in 1927 alone, in all public utility plants in the United States, of 34,000,000 tons of coal; in the last eight years, the cumulative savings aggregate nearly 140,000,000 tons.

The utilities embody, not only individual savings by far more than a million customer security holders, but the savings of countless others through insurance companies and other forms of trusteeship, the accumulated excess of production over consumption. Those savings are devoted to greater productivity, to the easing of human effort and the providing of comforts. This should not signify merely more material possessions, wider scope for idleness and competitive ostentation; it should carry with it a wholesome growth of those enduring values generally recognized as constituents of a higher civilization, emerging from the initial exhilaration of mere acquisition. There is reason to believe that these things are gradually coming to pass, and that the increasing application of the sources of power in nature, through electrical means, for the benefit and convenience of mankind is a significant factor in a continuing process.



Twelve Months in Retrospect

Technical triumphs, building, installation and interconnection went steadily on. Despite water-power controversies, politics and floods, 1927 proved full of encouragement

ELECTRICAL engineering achievements of a sufficiently novel character to figure as news of the industry in 1927 were recalled in the ELECTRICAL WORLD for Dec. 3. In the light and power field they included the installation or placing on order of a quantity of equipment of various sorts which in one particular or another was of unprecedented rating and the coming into service almost simultaneously in Chicago and New York of 132-kv. underground cable of Pirelli type. In the allied field of communication television sprang into being and transatlantic telephony became a commercial reality.

Though such engineering advances were fundamentally the most important industry news in the last twelve months, political complications were by their nature the most discussed events and those to which most heed was given by the general public. When the year opened discussions over the disposition of the government property at Muscle Shoals and the proper solution of the triple problem of the Colorado basin—flood prevention, irrigation and generation—were filling many pages in the *Congressional Record* and many columns of the newspapers.

DEBATE AD INFINITUM

Nineteen-twenty-seven has given way to 1928, the Sixty-ninth Congress has been succeeded by the Seventieth, seven Western governors have met in solemn conclave, disputed and gone home, but the same discussions wax warm again and the identical arguments pro and con are iterated and reiterated in the Capitol lobbies and will soon resound in the upper and lower chambers. If every word spoken on Muscle Shoals were a kilowatt-hour, power from the Tennessee would drug the Southern market. If every oratorical gesture anent Boulder Dam were the upward motion of a piston in an irrigation pump, the deserts of Arizona and Nevada would blossom like the fertilized regions in the Imperial Valley.

Discussion is a dearly bought prerogative of democracy, and it is better that the people through their chosen representatives should reach their own slow decisions on matters inextricably tied in with statecraft and politics than that aspersion should becloud the policies that industrial experts might enforce were the sole responsibility theirs. None the less, it is impossible not to contrast the inertia on the government-embargoed streams with the activity at Conowingo, from which 1928 will in all probability see energy transmitted, and with the beginning already made on the Saluda River in South Carolina. From these two privately owned water-power sites, which figured conspicuously in last year's news and which rival Wilson Dam in potential power, it is safe to predict that industry will receive a great accession of energy long before Muscle Shoals is properly put to work, to say nothing of the eleven sites on the upper reaches of the Tennessee. On the Falls of the Ohio in Kentucky, on the Tallapoosa and Coosa Rivers in Alabama, on Lake Chelan in Washington State, large privately owned hydro plants are rapidly being built. Others of a good size are under way in various states. In both northern and southern California the continuous performance of the largest two companies of that state has maintained its momentum. In July the Melones plant of the Pacific Gas & Electric Company, which is built at an irrigation dam, was dedicated, and November saw the completion of the Mono Bear diversion channel of the Southern California Edison.

STATE LAW AND REGULATION

Water power continued in 1927 to play a part in state legislatures as well as at Washington. Maine's lawmakers began to realize that, after all, the exportation of power might be a source of gain and not loss to that commonwealth, though no definite step was taken to repeal the law forbidding hydro power to be sent across the boundary. New York argued St. Lawrence development all over again, the Governor failing to convert the Legislature to his views and the Legislature failing to concoct a bill the Governor would sign. West Virginia's legislators left the water powers of that commonwealth where they found them—mainly unused. Wisconsin adopted a policy differing in its recapture provision from the federal water-power law and was at once plunged into litigation over it, the state winning the victory. North and South Dakota officials presented grandiose plans for the Missouri, and in still other states water power played its part on the legislative stage.

The state regulating commissions survived attacks in several legislatures, the assault in Indiana being perhaps the most determined. Chicago defeated a "home rule" bill at the polls, and measures designed to encourage public ownership plans on the Pacific Coast were beaten in San Francisco, Sacramento and Los Angeles.

Many indications point to a fresh struggle in the commissions between opposed valuation methods—"historic cost" and "prudent investment" being again lined up against "reproduction cost new less depreciation." Bugles for battle have been blown in Massachusetts, repeated in Wisconsin and Ohio and echoed from California. The awaited decision in the suit of the St. Louis & O'Fallon Railway against the Interstate Commerce Commission was handed down by a United States court in December. But apparently it settles nothing, and all that has so far been made certain by the Supreme Court of the United States is that the first two methods or either of them cannot be adopted to total exclusion of the third.

SENATOR WALSH'S RESOLUTION

But the prospective incursion that has aroused the most interest throughout electrical circles is that for which the way has just been paved by the resolution reintroduced at Washington by Senator Walsh of Montana to appoint a committee of five senators to investigate the electric light and power industry and the gas industry. Sent to committee before Christmas by a majority of four votes, the resolution is not likely to be buried there. The utility companies and the recently rejuvenated Joint Committee of National Utility Associations will almost surely have the opportunity to establish the honorable character and public benefit of such companies and

to absolve in the public eye the great majority of them from connivance in the wiles of stock jobbers, speculators and promoters. Early in the year the industry came out unscathed from the investigation with similar objects conducted by the Federal Trade Commission.

Growth of the Systems

Water may run idly to the sea without turning a wheel or generating a kilowatt, but steam once created is always put to use, and 1927 saw steam challenge water power in the latter's own territory—in California, in North Carolina and in Alabama, for instance, where respectively fuel-fired stations of the Southern California Edison Company, the Southern Power Company and the Alabama Power Company, built, building or prepared for, figured in last year's news. The coming steam plants of the Insull companies at Pekin, Ill., and elsewhere; new generating units now installed at Pittsburgh, Buffalo, New Orleans, Norfolk, Scranton, Pa.; Springfield, Ohio; Inglis, Fla., and many other places, and a large projected plant on the Delaware opposite Wilmington, Del., formed the subject matter of items in the weekly chronicle.

Texas, with its ever-growing oil production, was the broad theater of incessant building of moderate-sized and small generating plants at strategic points to feed long interconnecting lines. Oklahoma was another especially active state. Transmission lines continued to spring up all over the country, and the now universally accepted policy of interconnection received steady impetus. Because of the completion of links in North Carolina, Tennessee and the Virginias, unbroken interconnection was set up from Chicago south to Mobile and Pensacola. It had previously existed east to Boston, and both of the long right-angled copper arms were successfully operated in parallel, though no power was actually transmitted. The three-company 220-volt tie-in of the Public Service Electric & Gas Company of New Jersey, the Philadelphia Electric Company and the Pennsylvania Power & Light Company was, however, the most important new piece of interconnection to get under way, and it will provide an immense reservoir of power for the north Atlantic seaboard.

In Quebec Province a notable piece of work was finished—the 136-mile, 187-kv. line from the hydro development at Ile Maligne to the city of Quebec. From Canada at large, with her whole industrial structure built up on water power, have come constant reports of the clamor for more. The new Gatineau Power Company took rank at a bound with the great private companies on the continent, and from its plants near Ottawa are soon to be built two lines to serve the Ontario Hydro-Electric Power system—one to eastern Ontario points and one all the way to Toronto. Canada has its own water-power problems, and last year's reports showed that conflict between the provinces and the Dominion over jurisdiction on the Ottawa and St. Lawrence Rivers is waged quite as vigorously as any parallel contest between a state and the federal officials at Washington.

Consolidations, mergers and purchases were probably as numerous in 1927 as they were in 1926 and included at least seven actual changes of financial control affecting large groups of operating companies, among them the taking over of the Fitkin companies by Insull and of three Byllesby companies in California by the Pacific Gas & Electric, the union of seven up-state New York properties, and of the two competing Indianapolis companies, and the consolidation of the Philadelphia Electric with the United Gas Improvement Company. The transactions of the year are listed at length on pages 46 to 54 of this issue.

Rural service, if not forging forward at express speed, may be said, in a sense almost literal, to be striding in seven-league boots. Nebraska, Indiana, Wisconsin, Texas, Georgia, New York and Washington are some of the states from which encouraging reports came.

Besides the always fruitful and successful annual conventions of the National Electric Light Association and the American Institute of Electrical Engineers, several other gatherings of especially interesting character were held in 1927. The Southern Appalachian Power Conference met at Chattanooga in October, and the status of electrical development in the Southern States was well canvassed from many points of view. In the same month the National Association of Railroad and Utilities Commissioners assembled at Dallas. Its most interesting discussion concerned the holding companies. Confidence in conservative, old-time companies of this type was generally expressed, but the speculative, financially weak and overpyramided concerns were the occasion of some emphatic headshaking.

The National Electrical Manufacturers Association held its first annual meeting in June and hit its stride for growth and performance; the Electrical Supply Jobbers Association and the Society for Electrical Development were reorganized for better and completer service, and for the first time in the history of the industry its four major associations—of central-station men, manufacturers, jobbers and contractors—united through their respective heads in a communication to the industry at large designed especially to further commercial progress through closer co-operation.

Another interesting meeting was that of the International Electrotechnical Commission in Italy, at Bellagio and Rome, when the way was paved for the advancement of international standardization and the centenary of Volta's death was commemorated. An occasion of world-wide human interest was the attainment by Thomas A. Edison in February of his eightieth birthday amid universal acclaim.

Floods and Deaths

The year, on the whole one of uninterrupted progress, had its leaden lining in the spring flood disasters on the Mississippi and its tributaries and their fall counterpart in Vermont and New Hampshire and in spots elsewhere in New England and in New York. The story of how in both the Southwestern and the Northeastern territory the operating companies maintained service amid discouraging conditions and lived up to the best traditions of light and power production has been duly told.

Death hit the manufacturing branch of the industry hard in removing such men as Guy E. Tripp, chairman of the board of the Westinghouse Electric & Manufacturing Company; Anson W. Burchard, vice-chairman of the General Electric Company's board and chairman of the International General Electric's directors, and Harvey Hubbell. Sigmund Bergmann, the German manufacturer whose early career in America helped him to a great measure of success in his native land, also ceased his labors in the year just past. Among many others mourned by the fraternity were Wigginton E. Creed, president of the Pacific Gas & Electric Company; B. C. Edgar, vice-president and general manager of the Tennessee Electric Power Company, and Admiral W. H. G. Bullard, head of the Federal Radio Commission set up by Congress a few months before his death.

Telephone Developments—1927

International extension of communication facilities afforded by transatlantic telephony, lines to Mexico, and broadcasting networks. Toll rates reduced. Telephotography and television available. Permalloy helps equipment developments

CLEVELAND OFFICE OF OHIO BELL TELEPHONE COMPANY

AT THE end of 1927, 51 years after the invention of the telephone and 50 years from the installation of the first commercial telephone lines, there are in the United States more than 18,500,000 telephones. To connect these telephones to central offices and to provide for the interconnection of more than 70,000 cities, towns and villages throughout the country, there is a total of more than 63,000,000 miles of exchange and toll wire. Over this network an average of more than 72,000,000 local and toll conversations takes place daily. The growth in number of telephones in 1927 is shown in the accompanying table.

Telephony is distinctively an American art, the principal technical contributions to its improvement having taken place in this country. The intensive commercial development of the telephone in the United States is indicated by the fact that with 6 per cent of the world's population, the United States has about 60 per cent of the world's telephones. Progress in 1927 has taken place not only in the increase in number of telephones and in plant, but in the use made of present facilities and in improvements in the quality of telephone service throughout the country. Furthermore, the range of telephone communication has been increased by extensions to other countries, and important contributions to the future progress of the telephone art have been made. In many items, new ways have been found of reducing cost and improving efficiency, both as regards the elements which go to make up the complex telephone plant and the methods and practices employed in the operation thereof.

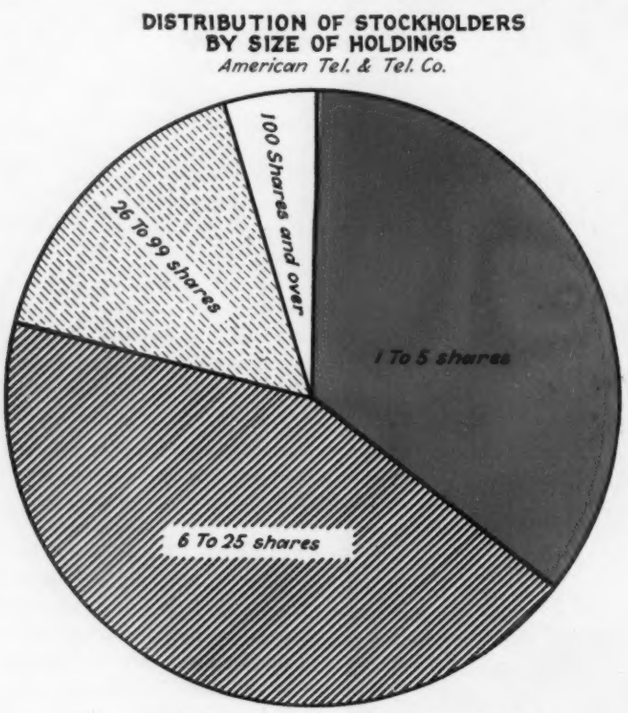
With regard to expenditures for new plant in 1927, figures covering the entire telephone industry in the United States are not yet available. It can be said, however, that total expenditures for new plant in the Bell system for 1927 are expected to reach $390,000,000, as compared with $380,000,000 in 1926, which will increase the system's facilities in taking care of additional business and for keeping the facilities of the system at the highest standard. Part of this is for new plant to replace plant retired because of obsolescence, changes to meet requirements of the public, inadequacy, on account of its being worn out or because of destruction by storms or floods. For

1926 the plant so replaced cost $122,000,000. The investment in plant and equipment in the Bell system devoted to furnishing telephone service at the beginning of 1928 amounts to more than $3,000,000,000.

As of Sept. 30, 1927, the number of employees of telephone companies in the United States was about 378,000. In addition, upwards of 50,000 were employed in telephone manufacturing and many more in the production of the raw materials required.

Telephone Buildings

The need for a large building program to house telephone equipment and the operating and administrative forces is an indication of the rapid growth of the telephone business. Noteworthy among the telephone buildings recently opened for occupancy is the new building


DISTRIBUTION OF STOCKHOLDERS
BY SIZE OF HOLDINGS
American Tel. & Tel. Co.
100 Shares and over
26 To 99 shares
1 To 5 shares
6 To 25 shares

OVER THREE-QUARTERS OF ALL STOCK IS HELD BY SMALL SHAREHOLDERS

of the Ohio Bell Telephone Company in Cleveland, Ohio, opened in July, 1927. An illustration of this building appears on page 27. This building is 22 stories high and contains about 333,000 sq.ft. of floor space, and houses, in addition to administrative offices and dial central office equipment having capacity to serve about 47,000 stations. Space is provided for the necessary equipment and switchboards to take care of the toll and long distance services. Ultimately, the building can, if necessary be arranged to provide space for dial equipment for, perhaps, 200,000 stations. Another important building recently erected is the new 32-story building of the New York Telephone Company, the first ten stories of which, each having an area equivalent to an entire block, are designed for telephone equipment, and are capable, if desired, of housing dial equipment sufficient to provide for approximately 200,000 telephone stations. In this class should be mentioned the administrative building of the Southwestern Bell Telephone Company in St. Louis, 30 stories high, which also provides for housing central office equipments. A similar building recently erected in San Francisco by the Pacific Telephone & Telegraph Company contains administrative offices only. It has been found that where a many-storied building is necessary in order to utilize valuable land to the best advantage, such a building, even more than the smaller buildings, can be made so architecturally fine that it becomes an object of pride to the community as a whole. Buildings of similar type and more or less comparable in size are now under construction in Newark, Denver, Dallas, Kansas City, Oklahoma City, Detroit and Montreal.

Transatlantic Telephony

An outstanding accomplishment of the year was the opening of transatlantic radio telephone service on Jan. 7, 1927, between New York and its suburban area and London and its suburban area. This service, handled jointly by the American Telephone & Telegraph Company and the British Post Office, was gradually extended on both sides of the Atlantic until, on March 26, it included all points in the United States and all points in England, Scotland and Wales. On March 11, the service was further extended to Cuba, and on Oct. 3, it was extended to the Canadian cities of Ottawa, Montreal, Quebec, Toronto and Hamilton. At the time the service was opened a total of 4.5 hours of service daily was given. At present 10.5 hours daily are given.

YEAR'S GROWTH IN TELEPHONES

Bell System and Connecting Companies	Jan. 1, 1928	Jan. 1, 1927
Bell-owned telephones	13,700,000	12,816,000
Bell-connecting telephones	4,650,000	4,758,000
Total	18,350,000	17,574,000
Telephones not connecting with Bell System	167,000	172,000
Total telephones	18,517,000	17,746,000

Opening of Lines to Mexico

On Sept. 29 occurred the formal opening of telephone communication between the United States and Mexico. The establishment of communication between the American and Mexican telephone systems is another significant step in extending the effective range of long distance telephony beyond our national boundaries. The long distance circuit recently completed by the Mexican Telephone & Telegraph Company, an associated company of the International Telephone & Telegraph Corporation, extends from Pueblo to Mexico City and from there to Nuevo Laredo on the Mexican border, with a branch line to Tampico and Victoria. It crosses the border at Laredo, and from there a circuit of the Bell system connects it with the southern transcontinental route.

New Long Distance Facilities

In addition to the foregoing, there were some notable extensions of long toll lines in 1927. Ten days after the opening of the New York-London telephone service, public service was inaugurated on the newly-completed third transcontinental telephone line following the northern route, which gives direct service between the Pacific Northwest and Chicago and eastern cities. This line provides a direct circuit between Chicago and Seattle 2,240 miles in length. The first transcontinental line to San Francisco, the central route, was opened Jan. 25, 1915. Rapid increase in public demand for long distance communication, however, necessitated a second

line, and the southern transcontinental was opened in 1923 from New Orleans to El Paso and Los Angeles.

New Methods of Handling Toll Calls

Toll service has been greatly improved through the extension of local board handling to an increasingly large portion of the total traffic and the development of better methods for use at toll boards. The short-haul low rate traffic which makes up a considerable majority of the total toll business, particularly in the metropolitan areas, is now largely handled at the local switchboards in about the same manner local calls are handled.

Until recently, the toll board business has been handled by a plan which provided for the ticketing of orders for service by a special group of operators known as "recorders," and the distribution of the tickets to other operators who undertook the work of advancing the calls over the toll lines. Through improvement in operating and supervision, it became possible to combine the recording and line-operating work. A method, taking advantage of this situation, was developed, which results in a large majority of toll-board calls being completed while the subscriber remains at the telephone; certain calls involving difficult switched connections and other special operating requirements continue to be handled by the former practice. This change in toll-board-operating plan has been introduced rapidly throughout the Bell system, the conversion being already complete except for a few cities where major equipment rerrangements, which require some time to effect, are involved.

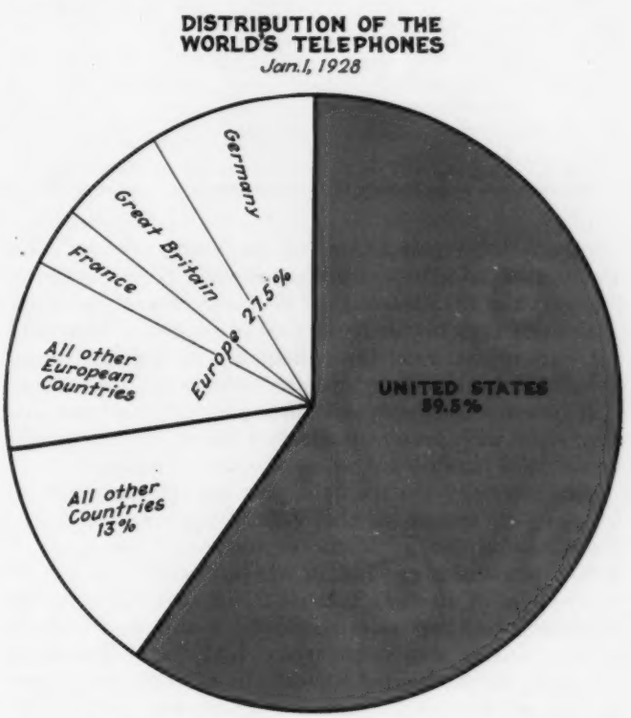
The introduction of this new toll-board method has resulted in improving the speed of service from an average of 6½ minutes in 1925 to an average of about 2½ minutes at present. The "speed of service" is defined as the interval from the time the call is received by the toll operator until the connection is established, or until a report of delay encountered in establishing the connection is given. This speed improvement has been made without unsatisfactory reactions on the efficient use of toll-line plant, which is an obviously important factor in the handling of the longer haul business.

Reduction in Toll Rates

Coincident with the improvement and extension of long distance service, there has been a further reduction, effective Dec. 1, 1927, in the rates for talking to long distance points over the telephone lines of the Bell system. The last previous change in the rate schedule for interstate long distance service became effective Oct. 1, 1926, and represented an annual saving to the public of about $3,000,000. It is estimated that the schedule which went into effect on Dec. 1 will result in a further annual saving to telephone users of about $1,500,000. This additional reduction in rates is the result of further improved instrumentalities and methods developed by the American Telephone & Telegraph Company and the Bell Telephone Laboratories, Inc., which have effected economies applying especially to the longer circuits. An important factor in this reduction is the steady growth in the country's network of highly efficient and practically storm-proof long distance cables, a description of which appeared in last year's "Statistical Issue" of the Electrical World.

In 1927 the scope of the telephotograph service given for three years between New York, Chicago, San Francisco, and, for a shorter period, to Boston and Cleveland, was materially enlarged by the extension of the network on Jan. 10, 1927, to Atlanta and Los Angeles, and, about a month later, to St. Louis. The usefulness of the telephotograph service for the transmission of commercial documents, news pictures, police information, and for other purposes has been amply demonstrated, and important improvements of this service are under way.

Perhaps the most spectacular accomplishment in communication during the year was the development and demonstration, on April 7, 1927, of television over communication channels of the Bell system. In that demonstration, television was shown both by wire and by radio. The wire demonstration consisted of the transmission of images from Washington to New York, a distance of more than 250 miles, by wires. In the radio demonstration, images were transmitted from the experimental station of the Bell Telephone Laboratories, Inc., at Whippany, N. J., to New York City, a distance of 22 miles Images of speakers in Washington addressing remarks



SIXTY PER CENT OF WORLD'S TELEPHONES IN UNITED STATES

intended for an entire audience, and of singers and other entertainers at Whippany, were seen simultaneously with the reproduction of their voices by loud-speaking equipment. These demonstrations were not based upon any radically new discovery, but rather was it an achievement made possible by the general growth of science and by recent important technical developments, many of them previously used in the telephone service. Among these, for example, are the photoelectric cell, methods of synchronization over long circuits, the distortionless vacuum tube amplifier, and transmission networks of predetermined characteristics. While the question as to what place television will take in our communication system has not been answered, the engineers and executives who have been concerned with its development are confident that, in many ways and in due course of time, television will be found to add substantially to human comfort and happiness.

Progress has continued in 1927 in the use of telephone circuits to connect radio-broadcasting stations for the

Bell System Statistics

There are throughout the United States 9,162 telephone companies and in addition 29,595 rural telephone lines operated mainly on a co-operative basis, which have arrangements with the associated Bell companies for the interchange of toll traffic. These are shown in the table as Connecting Companies and Connecting Rural Lines, and their telephones as Bell-Connecting telephones. All other statistics are for the American Telephone & Telegraph Company and its 24 associated companies combined and do not include data for connecting companies or rural lines.

The Bell System includes more than 50,000,000 miles of wire.

	Dec. 31, 1910	Dec. 31, 1915	Dec. 31, 1920	Dec. 31, 1925	Dec. 31, 1926	Increase during 1926*
Number of telephones:						
Bell companies	3,933,056	5,968,110	8,333,979	12,035,224	12,816,252	781,028
Bell connecting companies and lines	1,949,663	3,204,385	4,267,956	4,685,000	4,758,000	73,000
Total telephones	5,882,719	9,172,495	12,601,935	16,720,224	17,574,252	854,028
Number of Central Offices	4,933	5,300	5,702	6,017	5,998	*19*
Number of connecting companies	7,396	8,735	9,231	9,227	9,162	*65*
Number of connecting rural lines	10,449	19,579	26,032	28,861	29,595	734
Miles of pole lines	282,877	330,602	358,091	386,064	385,882	*182*
Miles of exchange wire:						
Wire in underground cable	5,630,851	9,947,359	14,384,135	28,425,392	31,845,228	3,419,836
Wire in aerial cable	2,800,000	4,503,124	5,586,531	9,462,213	10,785,029	1,322,816
Open wire	1,247,367	1,601,579	1,633,802	1,953,235	1,933,977	*19,258*
Total exchange wire	9,678,218	16,052,062	21,604,468	39,840,840	44,564,234	4,723,394
Miles of toll wire:						
Wire in underground cable	386,088	625,792	1,363,398	2,057,196	2,323,368	266,172
Wire in aerial cable	70,000	98,804	299,385	1,209,332	1,543,358	334,026
Open wire	1,507,906	1,728,887	2,110,153	2,366,172	2,430,190	64,018
Total toll wire	1,963,994	2,453,483	3,772,936	5,632,700	6,296,916	664,216
Total miles of wire	11,642,212	18,505,545	25,377,404	45,473,540	50,861,150	5,387,610
Average daily telephone conversations:†						
Exchange conversations	21,681,471	25,183,799	31,835,353	46,702,307	49,979,855	3,277,548
Toll conversations	602,539	819,030	1,327,247	2,098,163	2,374,979	276,816
Total conversations	22,284,010	26,002,829	33,162,600	48,800,470	52,354,834	3,554,364
Number of employees‡	120,311	156,294	231,316	293,095	300,628	7,533

* Decrease shown in italics.
† For year ending Dec. 31.
‡ The employees of the Western Electric Company, Inc., numbering approximately 45,000 on Dec. 31, 1926, are not included.

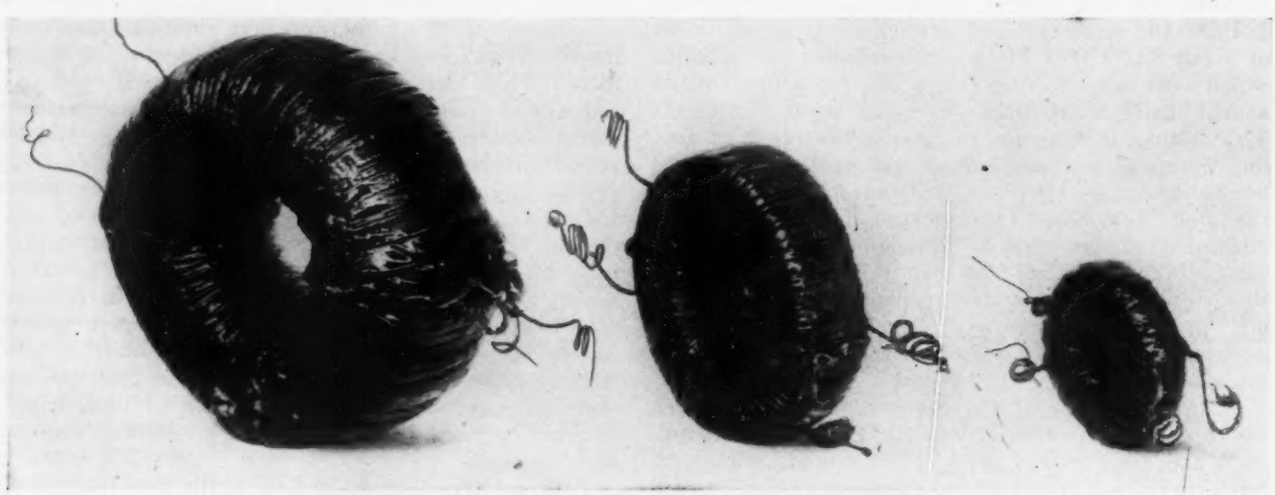
simultaneous broadcasting of programs through the medium of widely separated stations. An example of this was the broadcasting of the speeches at the Radio Industries Banquet in New York through 75 broadcasting stations scattered throughout the United States and connected by the long distance telephone lines of the Bell system. Such extensive broadcasting could not have been done with present methods without the use of telephone wire facilities.

An interesting event of the year was the participation by the Bell system in the Volta Exposition at Como, Italy, held in honor of the centenary of the death of Allesandro Volta, the Italian whose electric pile was the forerunner of modern batteries. In two rooms in the exhibition building were displayed a number of photographs, charts and maps which told the story of the telephone in the United States. In addition, there were models of historical types of telephones and switchboards. A number of papers were presented by American engineers.

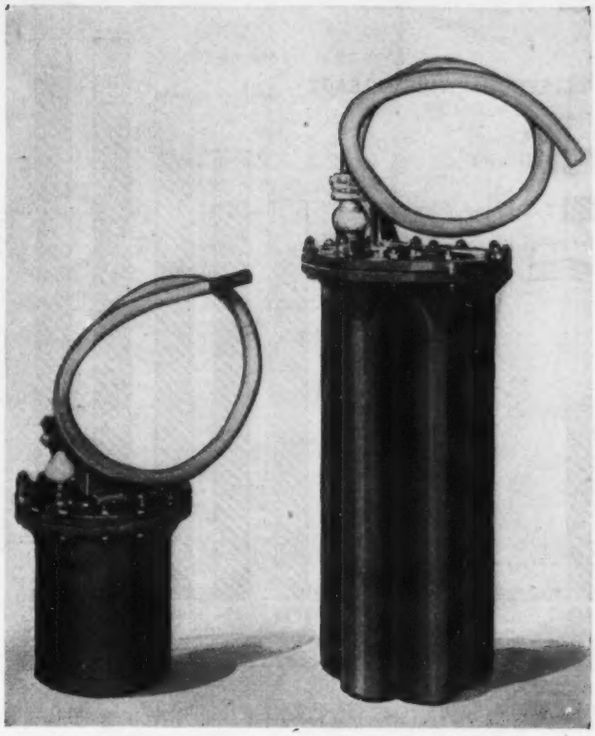
Research and development devoted both to physical things and to methods of operation have been perhaps the most important basic factor in the phenomenal growth of the telephone industry in the United States. Many of the results of this work are apparent to the telephone-using public and not infrequently they are spectacular. A very large part of the work is, however, directed to things of which the telephone user is generally quite unaware, the results of such work, though important, appearing only as part of the general improvements in telephone operation.

The development of loading coils, one of the plant items to which important additional contributions have been made in 1927, is an interesting example of the development and research work on all phases of the telephone plant continually carried on by the Bell system.

The commercial application of loading to telephone circuits by means of inductance coils inserted at periodic intervals goes back about 25 years. The principle of "coil loading" was discovered by Professor Pupin of



USE OF PERMALLOY HAS PERMITTED REDUCTION IN SIZE OF LOADING COILS



SMALLER LOADING-COIL CASES PERMITTED BY PERMALLOY

Columbia University and patents were issued to him in 1900. The number of loading coils in the plant of the Bell system on Jan. 1, 1926, was about 1,250,000. By the end of 1927 it is expected this number will be doubled. In order to duplicate, by the use of heavier copper wires, the transmission now obtained by the use of loading in the plant, it would have been necessary to increase the cost of the plant by a vast sum, estimated at $300,000,000. Two-thirds of the saving is in the exchange or local plant as distinguished from the toll or long distance plant.

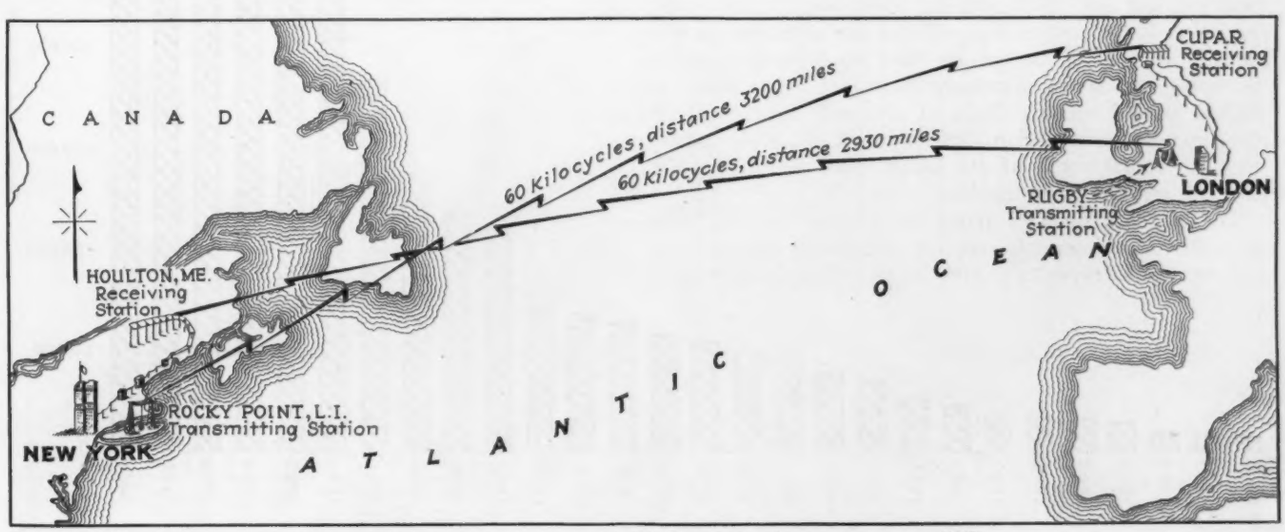
The term "loading" comes from the mechanical analogy of a "loaded" string, the study of which by a French mathematician was made good use of in developing the theory of loading. If one attaches a light cord, say fifteen feet long, to a rigid support at one end, then shakes the free end, waves much like waves on water are set up. These waves die out rapidly along the cord. Now if small weights, small pieces of wire solder, for example, are placed about six inches apart along the cord and it is again shaken at the free end, waves are set up, but their rate of dying out or attenuation is quite different. The cord is analogous to a telephone line, and the weights to loading coils. The effect of loading is to reduce the attenuation of the mechanical waves in one case and the electrical waves in the other. It makes the line a better path for electrical waves.

Loading telephone circuits has another effect, in addition to reducing attenuation. To reproduce speech requires the transmission of a wide "band" of frequencies. Maintaining the integrity of the complex wave shape of speech means transmitting this range of frequencies with substantially equal attenuation. Loading is used in cables to improve the line in this respect and reduce distortion.

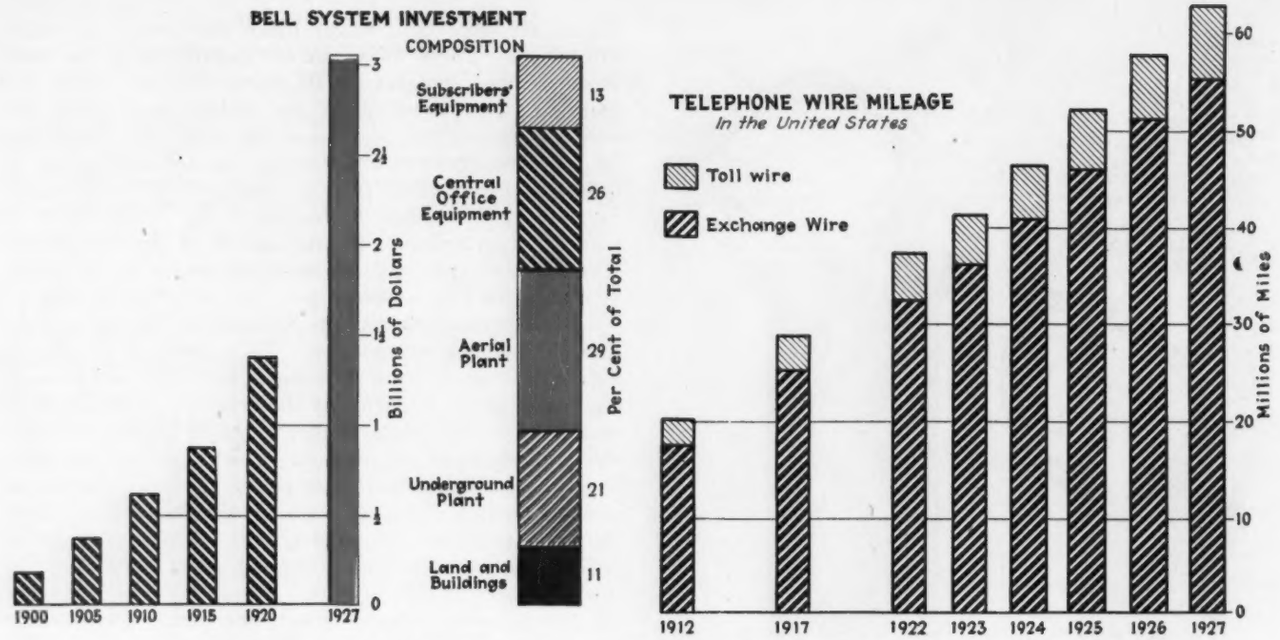
The practical value of loading will be realized from the statement that a loaded circuit in cable may be as good as an unloaded circuit having about eight times as much copper per mile of wire. The development of loading has followed a course much like that of many other inventions. First, there was the application of the principle by extensive design and development work, so that loading coils could be reliably and economically placed in the line. Next, there was the continuous improvement, over a period of nearly 25 years, to better the performance and reduce the cost. The development of the vacuum tube repeater and its application to long circuits brought about the need for extensive changes in loading. For open-wire lines it became evident that, with repeaters, loading coils could be dispensed with, while for cables, new types were required, having a degree of precision and stability not needed before the advent of repeaters.

Of comparable importance with the use of loading coils in the toll cable plant is their increasing application to the local exchange plant. The loading of local trunks has not only resulted in improved service, but has effected large economies by permitting a further extension of the use of small gage cable.

One important phase of the development has been the improvement and reduction in the cost of the core of the loading coil. In an early type of coil, about ten miles of wire no larger than a hair were required for the



COMMERCIAL TRANSATLANTIC TELEPHONY WAS AN ACHIEVEMENT OF 1927

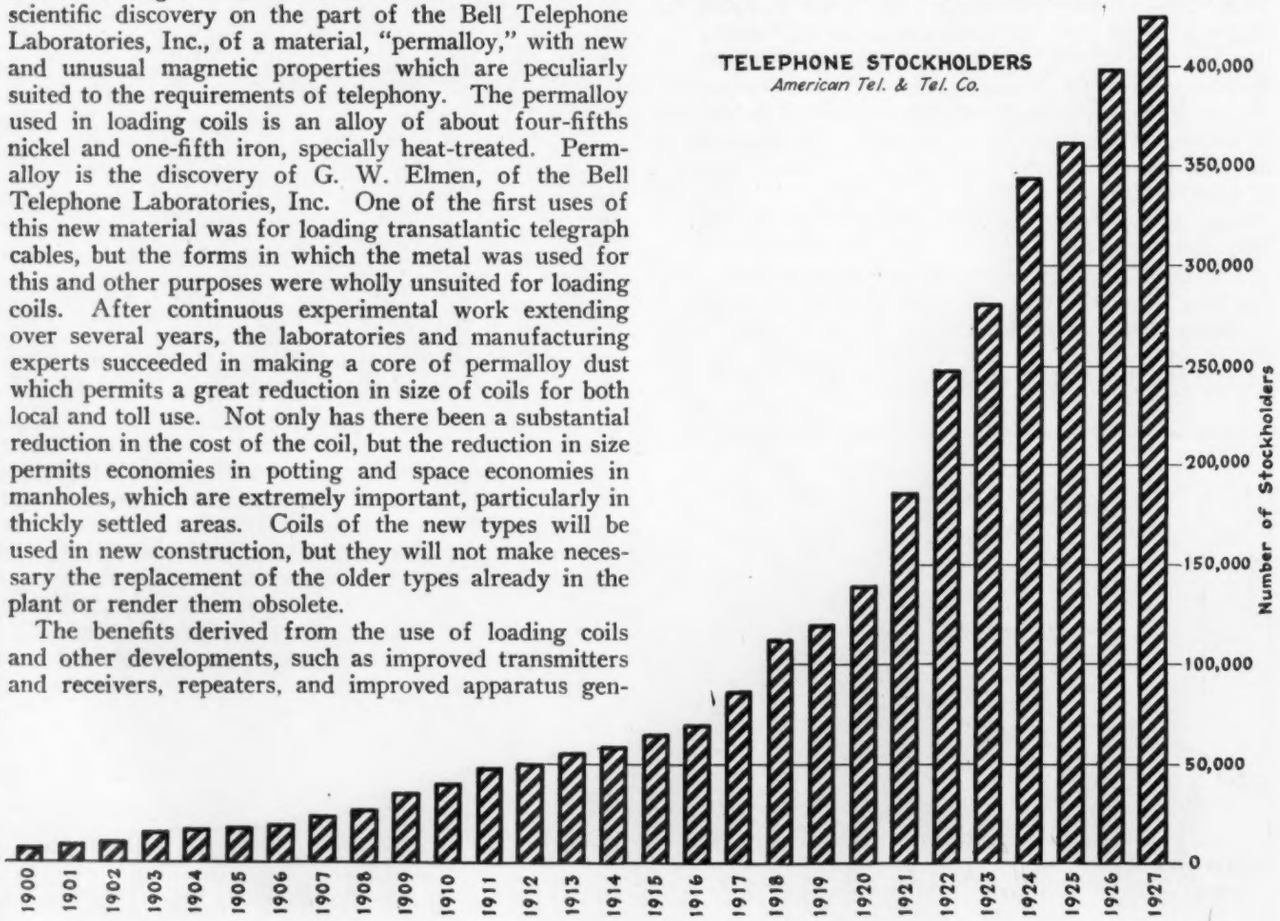


FIFTY PER CENT OF TELEPHONE PLANT INVESTMENT IS IN TRANSMISSION EQUIPMENT INVOLVING 63,000,000 MILES OF EXCHANGE AND TOLL WIRE

core. A later type of core was developed, composed of compressed iron dust, which has many physical advantages over the old and is cheaper.

The latest step forward in the design and construction of loading coils is the direct result of a fundamental scientific discovery on the part of the Bell Telephone Laboratories, Inc., of a material, "permalloy," with new and unusual magnetic properties which are peculiarly suited to the requirements of telephony. The permalloy used in loading coils is an alloy of about four-fifths nickel and one-fifth iron, specially heat-treated. Permalloy is the discovery of G. W. Elmen, of the Bell Telephone Laboratories, Inc. One of the first uses of this new material was for loading transatlantic telegraph cables, but the forms in which the metal was used for this and other purposes were wholly unsuited for loading coils. After continuous experimental work extending over several years, the laboratories and manufacturing experts succeeded in making a core of permalloy dust which permits a great reduction in size of coils for both local and toll use. Not only has there been a substantial reduction in the cost of the coil, but the reduction in size permits economies in potting and space economies in manholes, which are extremely important, particularly in thickly settled areas. Coils of the new types will be used in new construction, but they will not make necessary the replacement of the older types already in the plant or render them obsolete.

The benefits derived from the use of loading coils and other developments, such as improved transmitters and receivers, repeaters, and improved apparatus generally, together with improved cable, are not only permitting the utilization of smaller gage wires than has hitherto been possible, but the economical field for aërial and underground toll cables has been extended into the region which not many years ago it was possible to



MORE THAN 400,000 STOCKHOLDERS ARE INTERESTED IN TELEPHONE BUSINESS

Telephones in United States

(Jan. 1, 1926, and Jan. 1, 1927)

State	No. of Telephones Jan. 1, 1926	Jan. 1, 1927	State	No. of Telephones Jan. 1, 1926	Jan. 1, 1927
Alabama	109,512	115,451	Nevada	11,720	12,262
Arizona	29,728	31,727	New Hampshire	79,195	81,485
Arkansas	113,667	117,414	New Jersey	512,048	558,211
California	1,027,552	1,126,387	New Mexico	19,921	20,854
Colorado	170,575	176,906	New York	2,292,650	2,442,298
Connecticut	256,813	275,169	North Carolina	142,738	151,455
Delaware	26,406	27,617	North Dakota	83,276	84,291
Dist. of Columbia	127,977	137,327	Ohio	1,054,426	1,078,379
Florida	127,594	158,065	Oklahoma	256,719	270,053
Georgia	158,440	166,421	Oregon	169,613	178,597
Idaho	51,617	53,748	Pennsylvania	1,281,314	1,333,219
Illinois	1,522,959	1,603,271	Rhode Island	106,706	111,775
Indiana	535,426	536,671	South Carolina	60,708	62,911
Iowa	566,085	564,343	South Dakota	110,119	110,841
Kansas	380,509	387,772	Tennessee	203,289	215,813
Kentucky	223,444	220,105	Texas	557,889	590,106
Louisiana	118,969	130,485	Utah	59,423	61,060
Maine	127,030	128,622	Vermont	58,357	59,854
Maryland	180,826	191,752	Virginia	170,637	177,551
Massachusetts	808,194	843,170	Washington	271,453	286,135
Michigan	631,141	675,568	West Virginia	141,027	142,091
Minnesota	455,451	460,394	Wisconsin	482,353	499,890
Mississippi	71,543	76,502	Wyoming	27,471	27,410
Missouri	620,492	642,092			
Montana	56,221	56,870			
Nebraska	284,695	285,778	United States	16,935,918	17,746,168

serve only with some form of open-wire construction. This is of inestimable value from the standpoint of service.

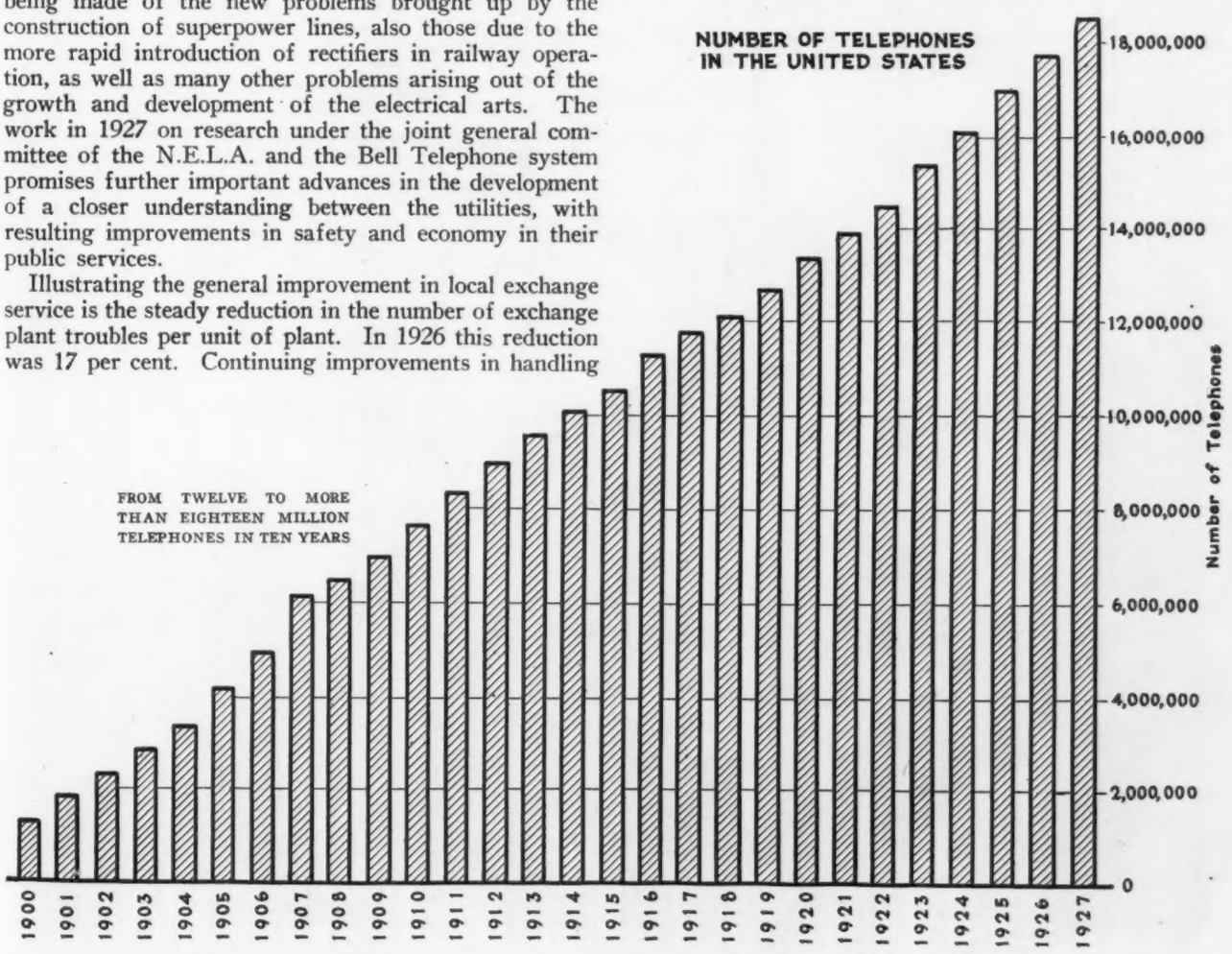
There has been continued progress in the co-operation between communication and electrical supply companies in working out problems common to both, which arise from the proximity of their wire systems. Studies are being made of the new problems brought up by the construction of superpower lines, also those due to the more rapid introduction of rectifiers in railway operation, as well as many other problems arising out of the growth and development of the electrical arts. The work in 1927 on research under the joint general committee of the N.E.L.A. and the Bell Telephone system promises further important advances in the development of a closer understanding between the utilities, with resulting improvements in safety and economy in their public services.

Illustrating the general improvement in local exchange service is the steady reduction in the number of exchange plant troubles per unit of plant. In 1926 this reduction was 17 per cent. Continuing improvements in handling interoffice calls have been made in the last year and the use of such methods as "straightforward trunking" have been extended. The introduction of the dial telephone system continued in 1927, with the result that the number of telephones in the Bell system operated with dial equipment increased during the year from about 2,000,000 stations to over 2,500,000 stations. Dial equipments are being installed where new switchboard equipment is needed and where consideration of the circumstances makes their use advisable.

Distribution of Telephone Stock

In the last year there has been an increase in the number of those holding securities of the telephone companies. The most widely-held stock, of course, is that of the American Telephone & Telegraph Company. The accompanying charts show the increase in stockholders of this company and bring out the fact that the average holding per stockholder is small. Many of the stockholders of the American Telephone & Telegraph Company are employees and many more, of course, are customers.

It is particularly true of the telephone business that satisfactory service depends in no small measure upon satisfactory relations between the company and its customers. Efforts have been continued in the last year, not only further to improve the technical features of telephone service, but also to maintain a sympathetic understanding between the users of telephone service and those furnishing that service.



Statistics on the Operations of the Electric Light and Power Industry Based on Research Studies Made by "Electrical World" and Data Collected by the U. S. Geological Survey and U. S. Census Bureau

	1912*	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928†
Total energy generated (millions of kw.-hr.)	11,569	21,230	25,438	29,200	34,900	39,519	36,971	43,560	51,133	54,413	61,159	69,158 (a)	75,116	81,500
Net import of energy (millions of kw.-hr.)	.....	1,022	1,225	1,129	1,143	950	1,020	862	1,055	1,400	1,239	1,506 (a)	1,650	1,708
Total energy generated and imported (millions of kw.-hr.)	11,569	22,252	26,663	30,329	36,043	40,469	37,991	44,422	52,188	55,813	62,398	70,664 (a)	76,766	83,208
Energy sold to lighting customers (millions of kw.-hr.)	2,752	3,807	4,530	5,400	6,460	7,850	8,700	9,560	11,410	12,990	13,790	15,000 (a)	16,300	17,808
Energy sold to power customers (millions of kw.-hr.)	3,254	9,990	12,560	14,400	17,890	19,960	17,400	20,620	24,810	25,810	30,130	35,154 (a)	38,486	41,300
Energy sold to electric railways (millions of kw.-hr.)	3,017	4,100	4,400	4,500	4,650	4,820	4,600	5,642	6,000	6,200	6,301	6,810 (a)	7,350	7,600
Energy lost in transmission (millions of kw.-hr.)	2,546	4,355	5,140	6,029	7,043	7,839	7,291	8,600	9,968	10,813	12,177	13,700 (a)	14,630	16,500
Total gross revenue (thousands of dollars)	302,273	436,000	526,894	664,850	773,650	882,750	944,400	1,072,120	1,269,550	1,354,570	1,480,500	1,652,300 (a)	1,783,700	1,910,000
Revenue from lighting customers (thousands of dollars)	(e) 271,096	.....	(e) 469,370	.....	.....	.....	570,500	657,120	795,000	902,670	979,500	1,018,200 (a)	1,075,800	1,135,000
Revenue from power customers (thousands of dollars)	.....	.....	.....	.....	.....	.....	267,800	303,200	358,150	321,000	367,540	461,000 (a)	517,900	580,000
Revenue from electric railways (thousands of dollars)	.....	.....	.....	.....	.....	.....	44,650	50,750	52,200	54,400	53,270	58,100 (a)	60,600	60,000
Revenue from other utilities (thousands of dollars)	31,177	.....	57,524	.....	.....	.....	61,450	61,050	64,200	76,500	80,190	115,000 (a)	129,400	135,000
Total operating expenses (thousands of dollars)	234,419	.....	(g) 426,568	.....	.....	(f) 440,000	(f) 432,400	(f) 481,570	(f) 576,880	(f) 617,980	(f) 650,000	(f) 723,000 (f)	766,700	820,000
Total sale of light and power securities (thousands of dollars)	.....	.....	.....	.....	.....	369,374	538,917	719,961	922,722	1,236,438	1,279,823	1,387,522	2,129,000	2,100,000
Sales of securities by investment houses (thousands of dollars)	.....	.....	.....	.....	.....	326,374	458,917	589,961	747,722	982,421	982,223	1,150,965	1,889,000	1,850,000
Sales direct to customers (thousands of dollars)	.....	.....	.....	.....	.....	43,000	80,000	130,000	175,000	254,017	297,600	236,557	240,000	250,000
Aggregate capitalization thousands of dollars (Dec. 31)	2,289,622	.....	3,245,185	3,600,000	4,100,000	4,400,000	4,600,000	4,817,000	5,800,000	6,600,000	7,500,000	8,400,000	9,500,000	10,500,000
Value of plant and equipment thousands of dollars (Dec. 31)	2,175,678	.....	3,060,392	.....	3,711,924	4,212,588	4,301,752	4,465,016	5,080,000	5,762,000	6,483,000	7,325,000	8,084,000	8,985,000
Expenditures for additions and extensions (thousands of dollars)	.....	.....	.....	.....	.....	.....	222,408	324,016	602,143	692,440	721,300	841,344	760,353	900,363
Total number of electric light and power establishments	5,221	.....	6,542	.....	.....	.....	.....	6,355	.....	.....	5,235	4,827	4,409	4,100
Tota number of commercial establishments (Dec. 31)	3,659	.....	4,224	.....	.....	.....	.....	3,774	.....	.....	3,143	2,796	2,537	2,300
Total number of municipal establishments (Dec. 31)	2,581	.....	2,318	.....	.....	.....	.....	2,581	.....	.....	2,092	2,031	1,872	1,800
Companies generating all or part of their energy (Dec. 31)	4,714	.....	5,124	.....	.....	.....	.....	4,380	.....	.....	.....	.....	.....	.....
Companies purchasing all their energy (Dec. 31)	507	.....	1,418	.....	.....	.....	.....	1,966	.....	(j) 1,886	.....	.....	.....	.....
Number of operating systems, 100,000,000 kw.-hr. output	.....	.....	.....	5	6	9	5	6	14	106	110	126	135	145
Total number of generating plants (Dec. 31)	5,221	.....	6,542	.....	.....	.....	.....	5,444	.....	.....	.....	.....	4,157	.....
Total number of commercial plants (Dec. 31)	3,659	.....	4,224	.....	.....	.....	.....	3,615	.....	.....	.....	.....	.....	.....
Total number of municipal plants (Dec. 31)	1,562	.....	2,318	.....	.....	.....	.....	1,820	.....	.....	.....	.....	.....	.....
Total generator rating, kva. (Dec. 31)	6,450,000	8,520,000	11,230,000	12,330,000	13,730,000	15,860,000	16,660,000	17,960,000	19,900,000	22,000,000	24,344,000	26,813,000	28,990,000	31,300,000
Total prime mover rating, horsepower (Dec. 31)	7,530,044	.....	12,936,755	.....	.....	.....	.....	20,296,235	.....	.....	.....	32,600,000	35,500,000	37,900,000
Total steam engines and turbines rating, horsep'r (Dec.31)	4,949,778	.....	8,449,076	.....	.....	.....	.....	14,171,222	.....	.....	.....	22,240,000	24,000,000	25,600,000
Total water wheels rating, horsepower (Dec. 31)	2,469,231	.....	4,277,273	.....	.....	.....	.....	5,822,018	.....	.....	.....	9,960,000	11,100,000	11,900,000
Total internal combustion engine rating, horsepower (Dec. 31)	111,035	.....	210,406	.....	.....	.....	.....	302,995	.....	.....	.....	400,000	400,000	4,000
Total number of customers (Dec. 31)	3,837,518	6,513,000	(g) 7,178,703	8,505,000	9,899,000	10,820,000	11,700,000	(g) 12,709,868	14,617,158	16,768,509	18,472,146	20,178,531	21,694,100	22,950,000
Total number of domestic lighting customers (Dec. 31)	3,100,918	5,260,000	5,810,300	6,900,000	8,010,000	8,700,000	9,430,000	10,211,232	11,819,100	13,567,490	14,965,100	16,359,279	17,596,390	18,600,000
Total number of commercial lighting customers (Dec. 31)	605,600	1,030,000	1,125,200	1,320,000	1,550,000	1,740,000	1,850,000	2,030,324	2,287,058	2,625,519	2,723,046	2,963,410	3,166,570	3,350,000
Total number of industrial power customers (Dec. 31)	131,000	223,000	243,203	285,000	339,000	380,000	420,000	468,312	511,000	575,500	784,000	855,842	931,140	1,000,000
Number of people living in electric-lighted dwellings (Dec.31)	14,000,000	22,800,000	25,250,000	29,950,000	34,700,000	37,000,000	40,800,000	43,100,000	51,000,000	58,300,000	64,400,000	70,300,000	75,500,000	79,800,000
Per cent of total population living in electric-lighted dwellings	15.9	22.2	24.3	28.7	32.8	35.1	37.5	38.9	45.7	51.4	55.7	59.5	63.0	67.0
Total number of employees (Dec. 31)	79,335	.....	105,541	.....	.....	.....	.....	150,762	.....	.....	.....	227,000	230,000	235,000
Average salary of all employees (dollars)	771	.....	902	.....	.....	.....	.....	1,409	.....	.....	.....	.....	.....	.....
Average salary of officers (dollars)	1,760	.....	2,211	.....	.....	.....	.....	3,287	.....	.....	.....	.....	.....	.....
Average salary of superintendents and managers (dollars)	1,353	.....	1,662	.....	.....	.....	.....	2,415	.....	.....	.....	.....	.....	.....
Average salary of clerks (dollars)	731	.....	825	.....	.....	.....	.....	1,344	.....	.....	.....	.....	.....	.....
Average pay of wage earners (dollars)	692	.....	833	.....	.....	.....	.....	1,312	.....	.....	.....	.....	.....	.....
Total consumption of coal (short tons)	.....	.....	21,565,273	.....	.....	.....	.....	26,130,865	28,712,580	32,556,970	35,321,502	36,594,540 (a)	37,442,120	38,300,000
Total consumption of oil (barrels)	.....	.....	6,158,219	.....	.....	.....	.....	11,855,969	13,915,128	16,096,675	9,742,238	8,970,356 (a)	6,409,635	4,570,000
Total consumption of gas (thousands of cubic feet)	.....	.....	14,199,204	.....	.....	.....	.....	20,174,385	29,287,251	46,993,070	45,479,189	52,160,061 (a)	65,465,314	79,000,000
Length of transmission lines, circuit miles (Dec. 31)	.....	.....	.....	.....	.....	.....	.....	86,290	94,880	102,270	112,800	124,900	134,400	140,900
Developed water power, horsepower (U. S. Geological survey) (March 1) (k)	.....	.....	.....	.....	.....	.....	7,926,958	.....	.....	9,086,958	10,037,655	11,176,596	11,720,983	12,370,000

* Data for 1912 are from U. S. Census Bureau except estimated energy, allocation; generator rating converted from kw. to kva. assuming 80 per cent power factor.

† 1928 figures are estimated based on past growth or known plans.

(a)—Estimated, based on ten months' operations.

(e)—Includes all income except from other utilities.

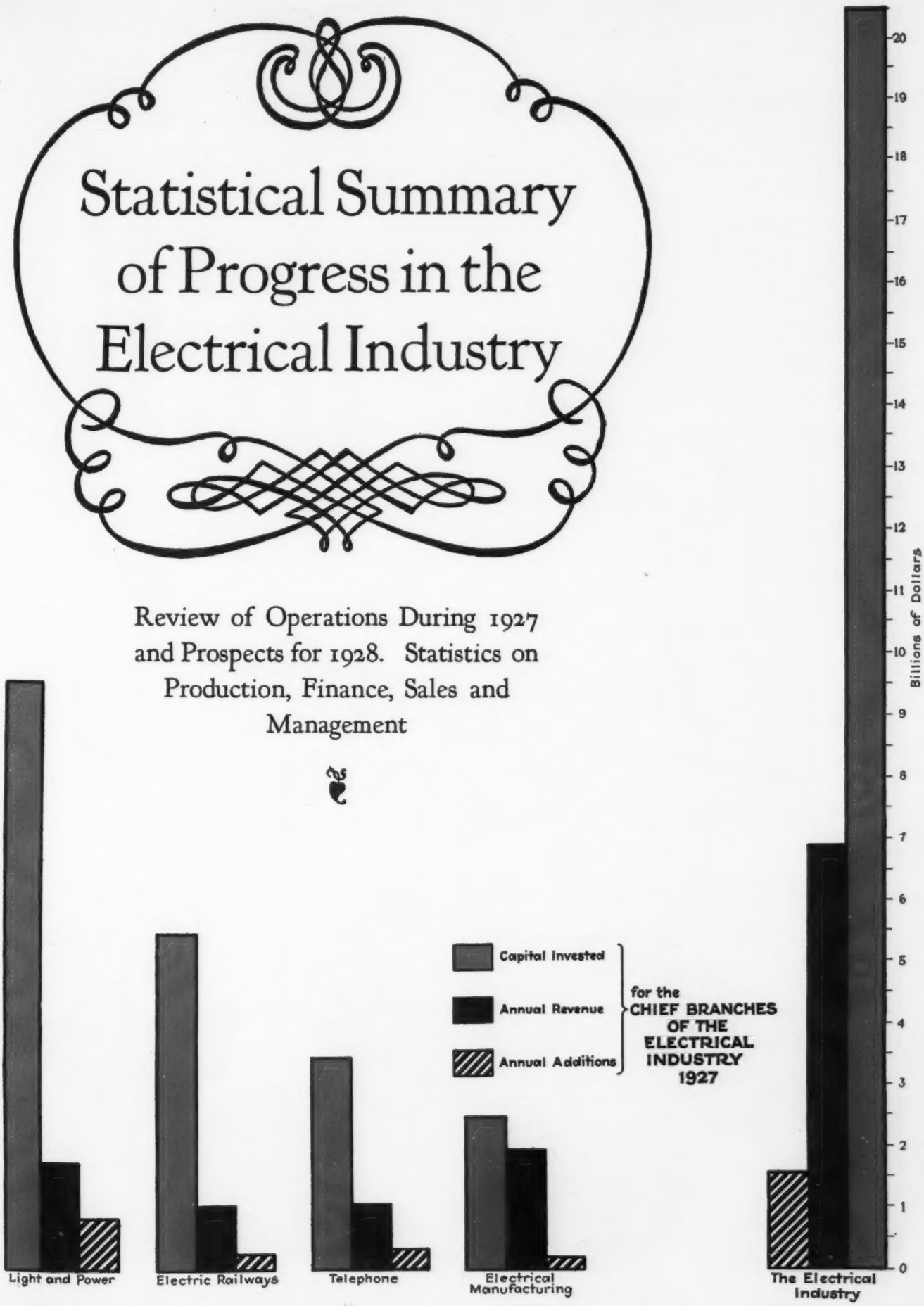
(f)—Does not include interest, taxes, depreciation or sinking fund.

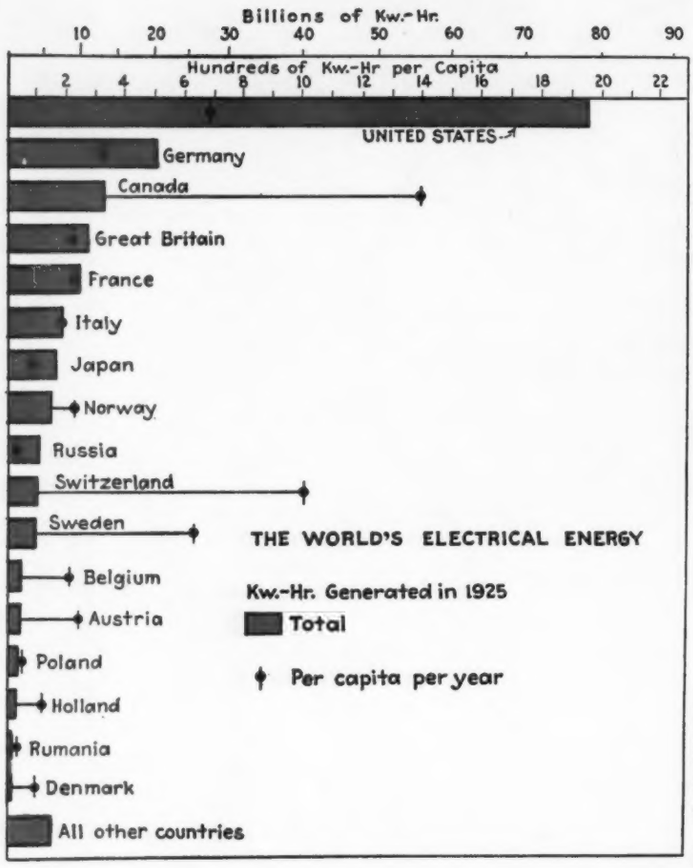
(g)—United States Census Bureau.

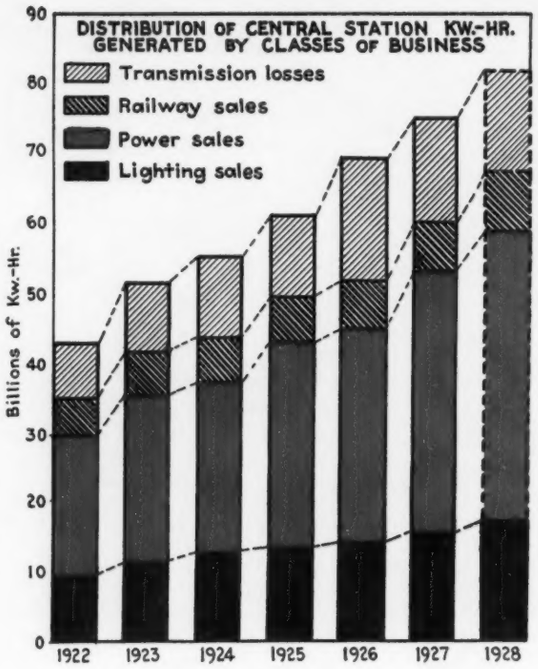
(j)—July 1. (k)—January 1, in 1927.

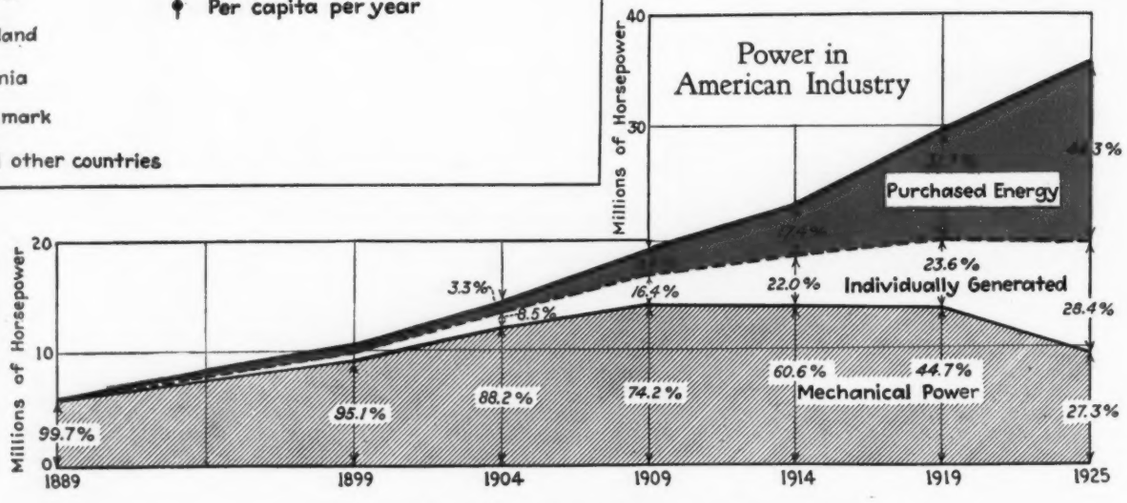
Statistical Summary of Progress in the Electrical Industry

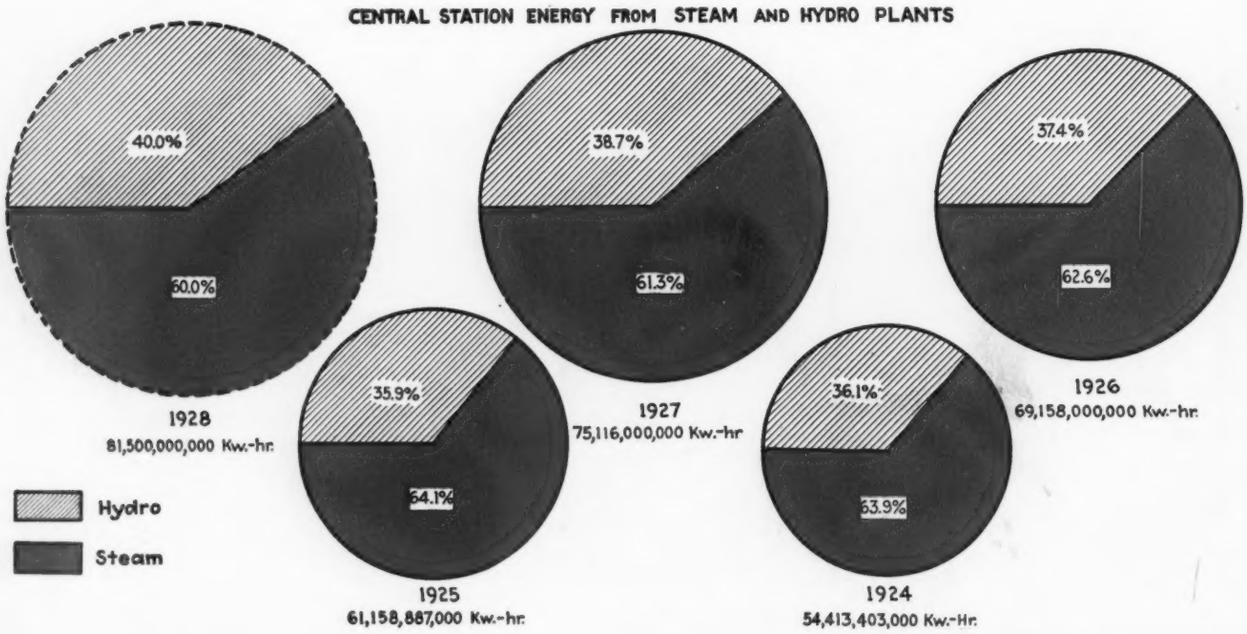
Review of Operations During 1927 and Prospects for 1928. Statistics on Production, Finance, Sales and Management

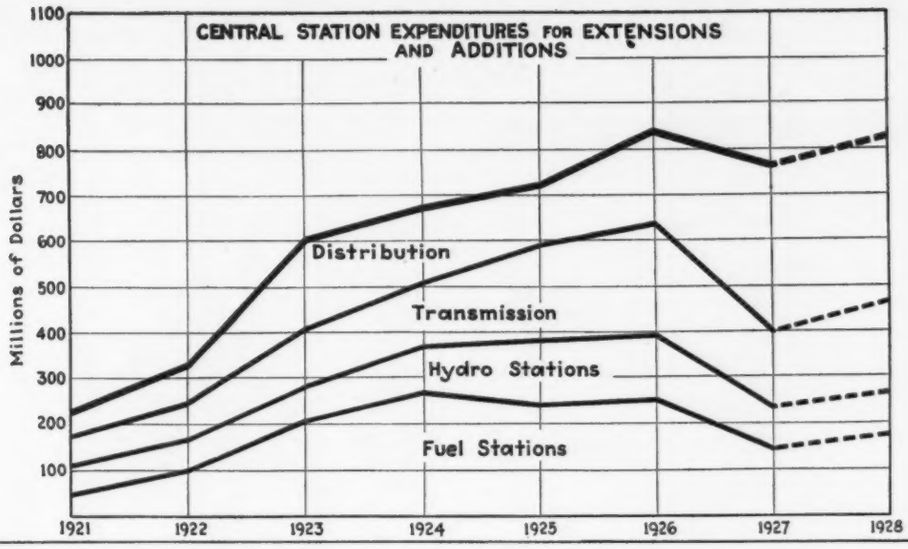


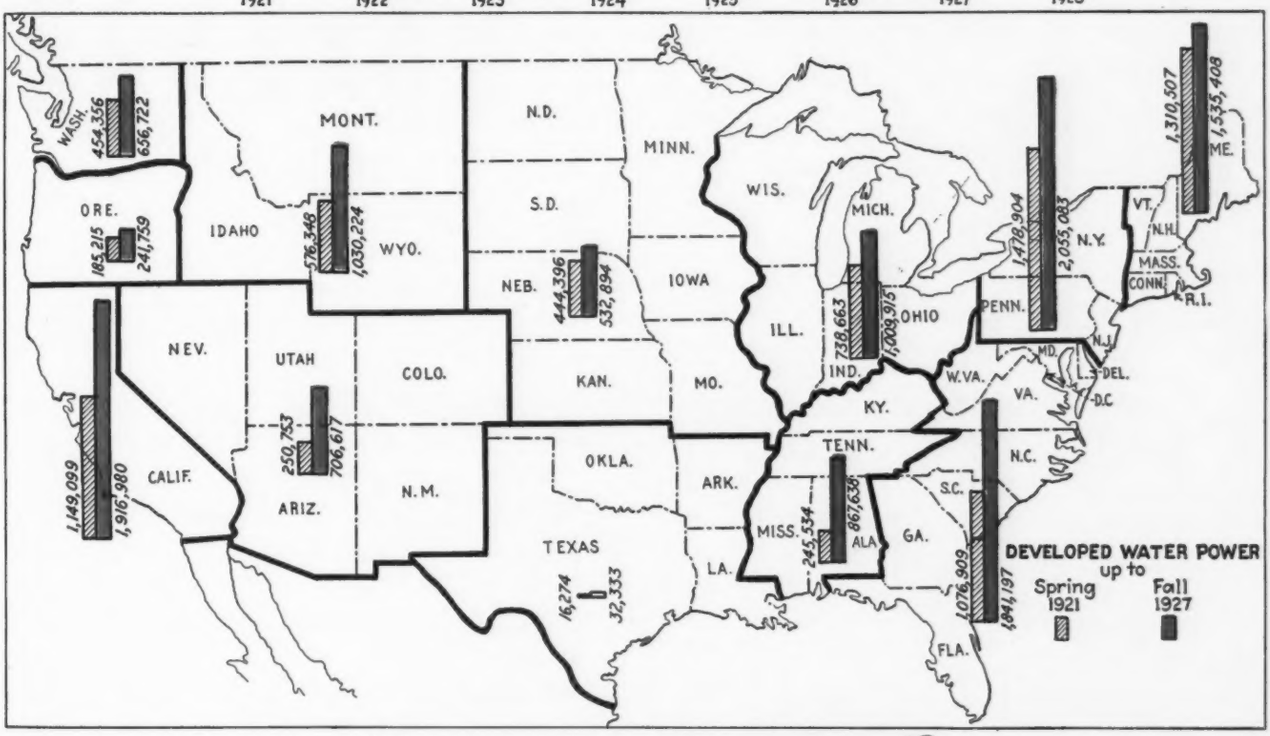

Billions of Kw.-Hr.
10 20 30 40 50 60 70 80 90
Hundreds of Kw.-Hr per Capita
2 4 6 8 10 12 14 16 18 20 22
UNITED STATES
Germany
Canada
Great Britain
France
Italy
Japan
Norway
Russia
Switzerland
Sweden
Belgium
Austria
Poland
Holland
Rumania
Denmark
All other countries
THE WORLD'S ELECTRICAL ENERGY
Kw.-Hr. Generated in 1925
Total
Per capita per year


DISTRIBUTION OF CENTRAL STATION KW.-HR. GENERATED BY CLASSES OF BUSINESS
Transmission losses
Railway sales
Power sales
Lighting sales
Billions of Kw.-Hr.
0 10 20 30 40 50 60 70 80 90
1922 1923 1924 1925 1926 1927 1928

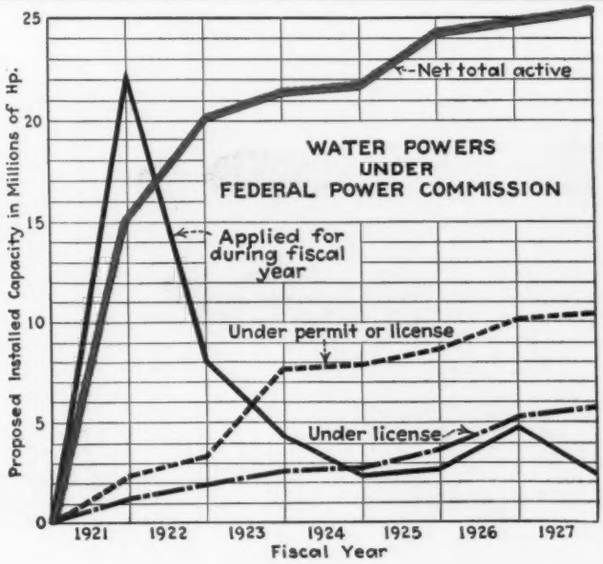

Power in American Industry
Millions of Horsepower
0 10 20 30 40
Purchased Energy
Individually Generated
Mechanical Power
99.7%
95.1%
88.2%
74.2%
60.6%
44.7%
27.3%
3.3%
8.5%
16.4%
22.0%
23.6%
28.4%
1889 1899 1904 1909 1914 1919 1925


CENTRAL STATION ENERGY FROM STEAM AND HYDRO PLANTS
40.0%
60.0%
1928
81,500,000,000 Kw.-hr.
38.7%
61.3%
1927
75,116,000,000 Kw.-hr
37.4%
62.6%
1926
69,158,000,000 Kw.-hr.
35.9%
64.1%
1925
61,158,887,000 Kw.-hr.
36.1%
63.9%
1924
54,413,403,000 Kw.-hr.
Hydro
Steam



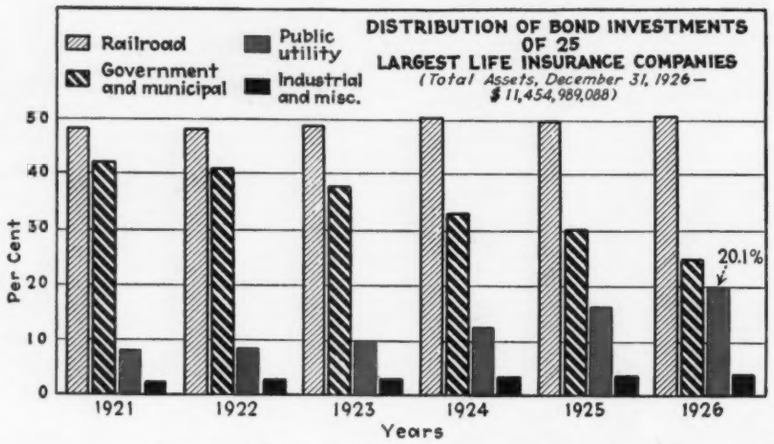


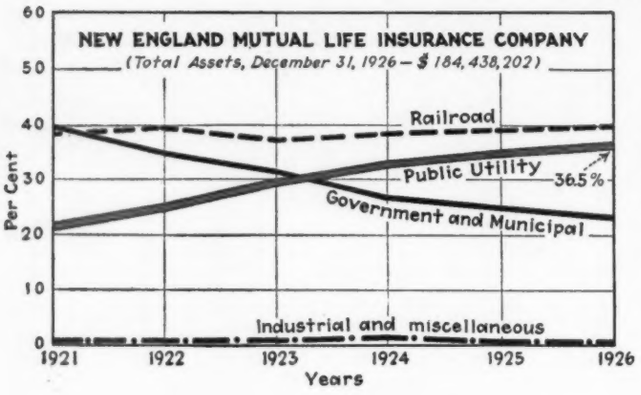
25,000,000 hp. is being actively developed under Federal Power Commission

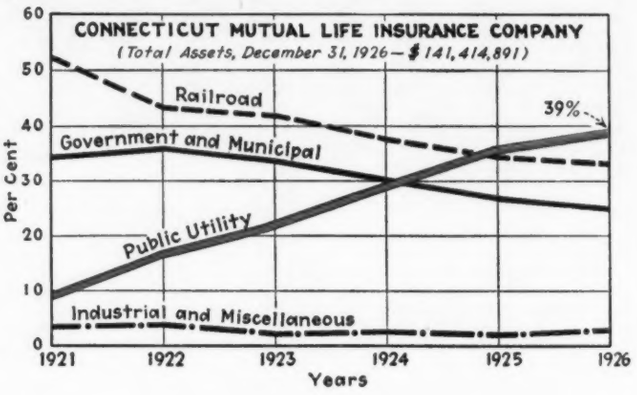


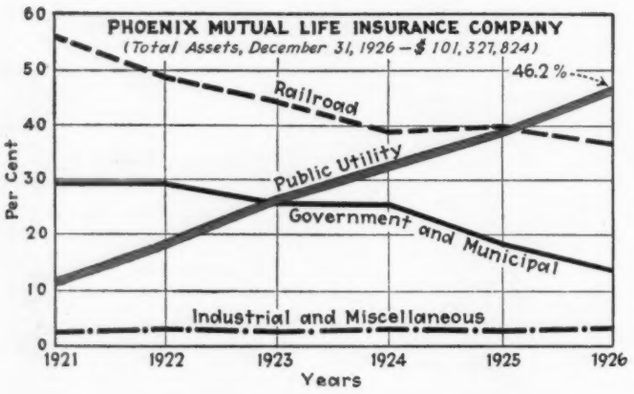
More than 7,000,000 hp. is developed east of Mississippi in hydro plants

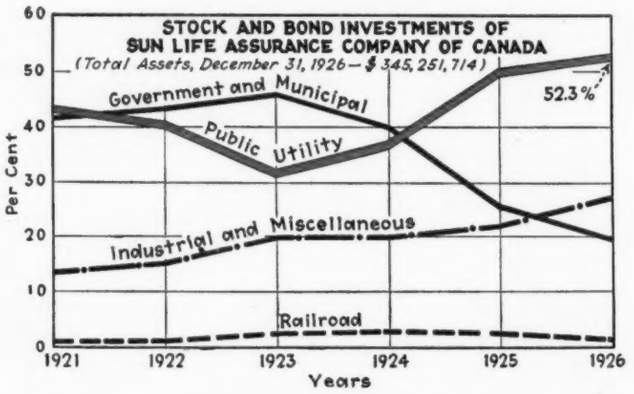
Utility securities gaining increased acceptance as investments by insurance companies

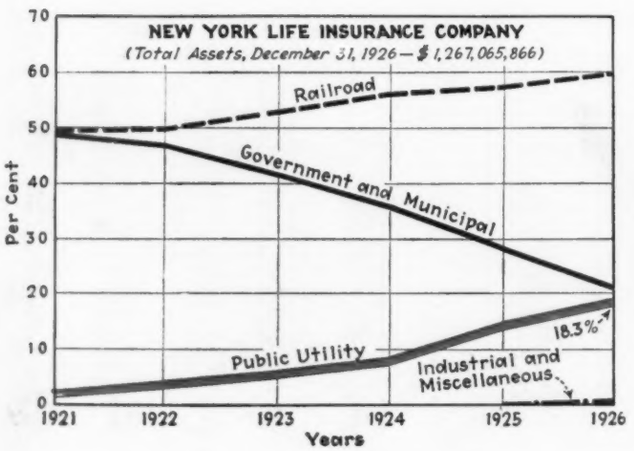


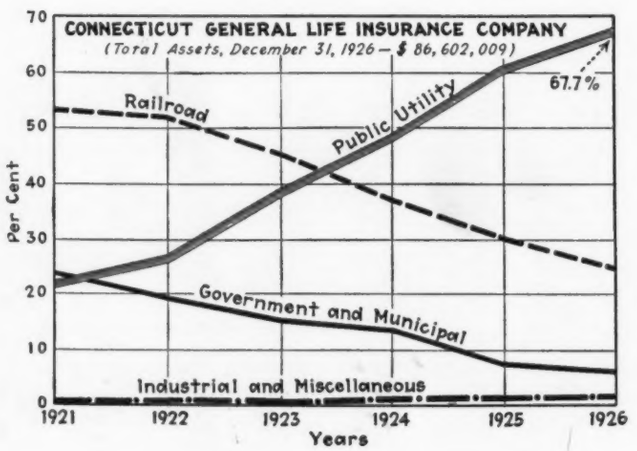


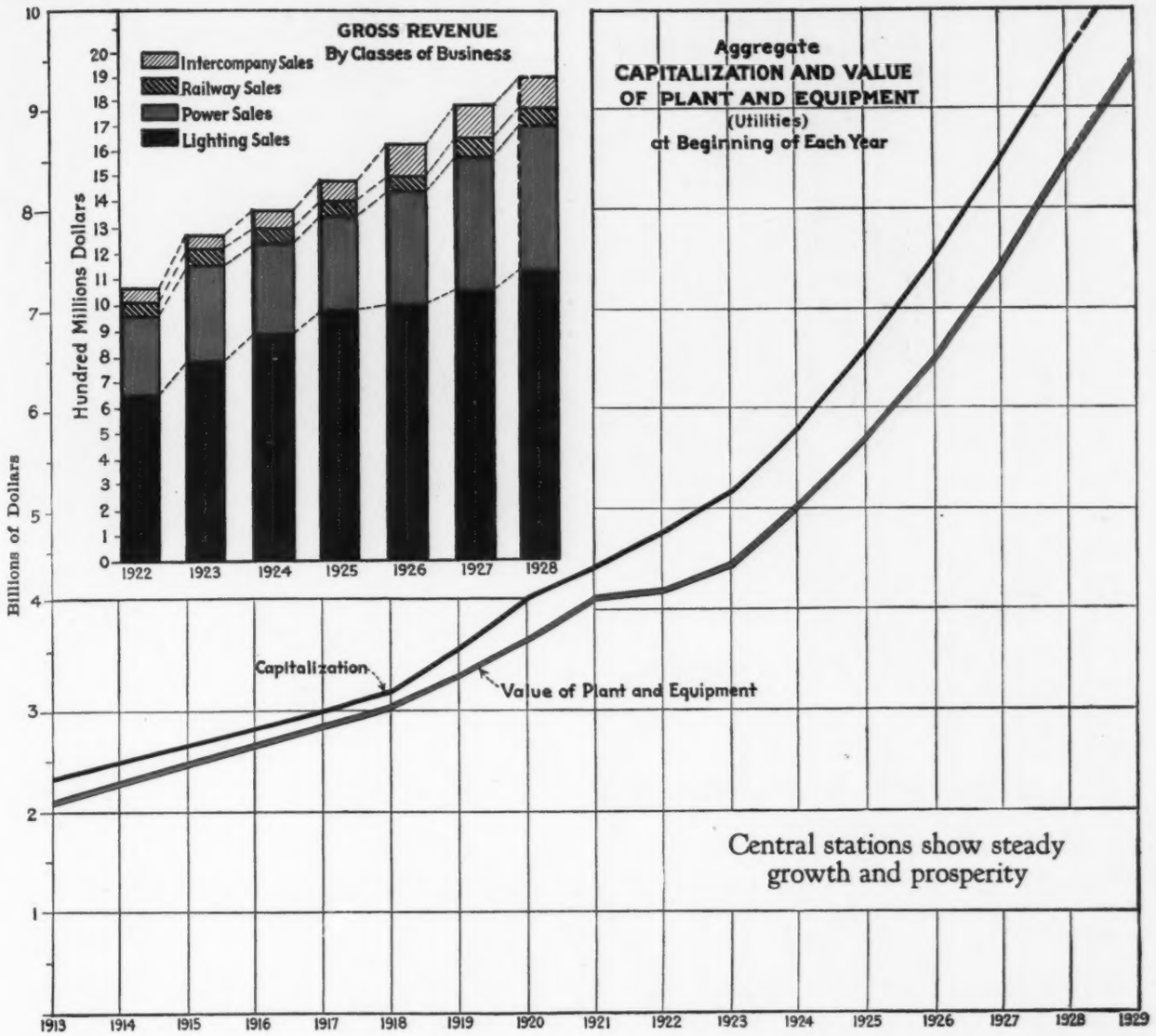


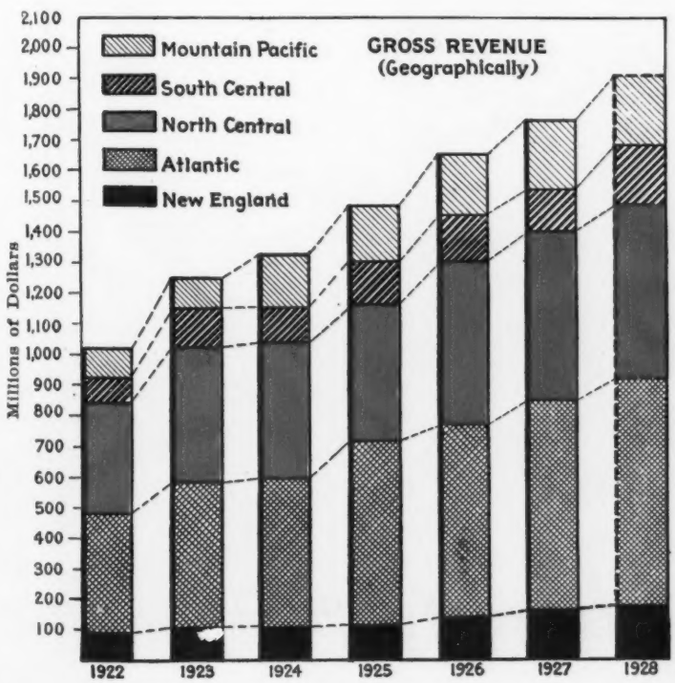


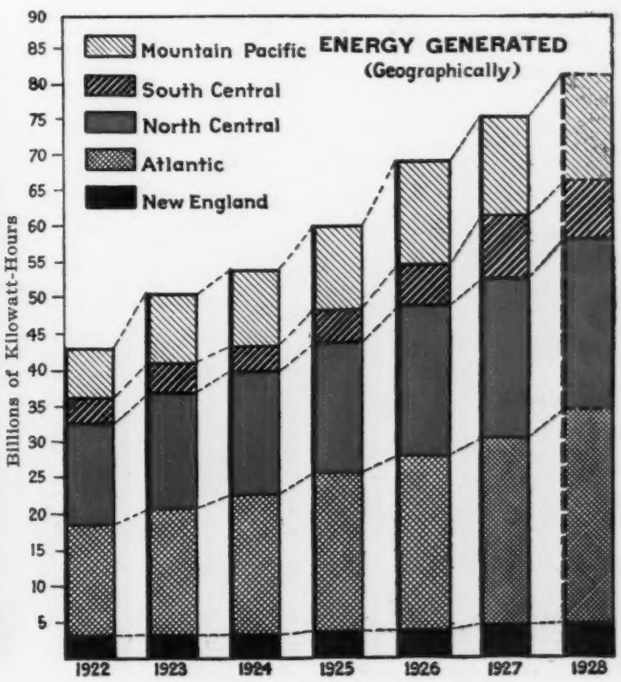


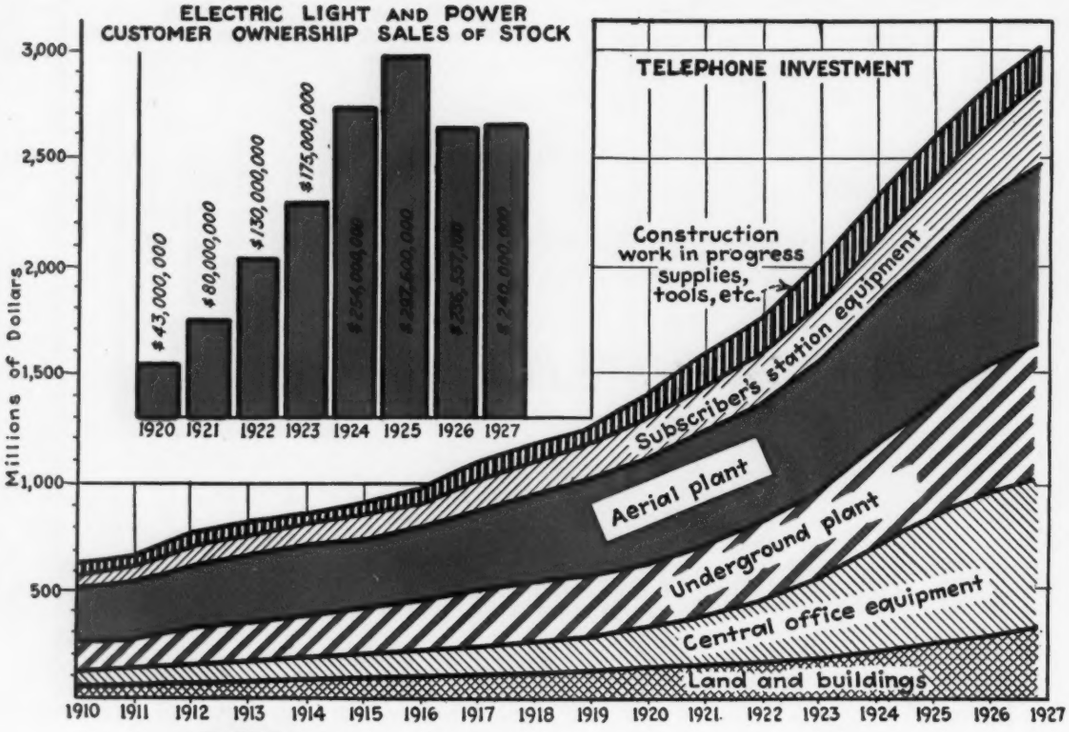


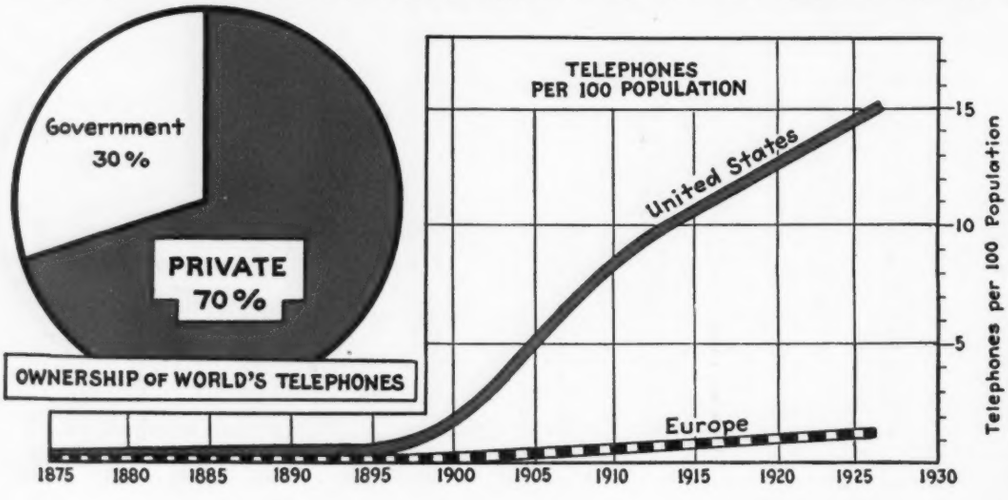


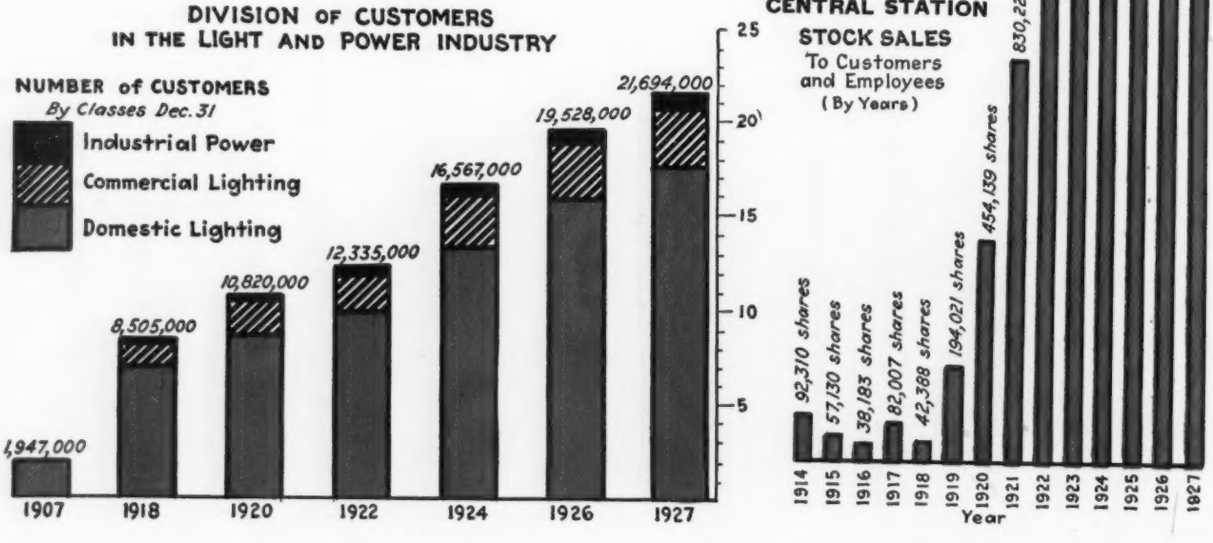

GROSS REVENUE
By Classes of Business
Intercompany Sales
Railway Sales
Power Sales
Lighting Sales
Hundred Millions Dollars
1922
1923
1924
1925
1926
1927
1928
Aggregate
CAPITALIZATION AND VALUE
OF PLANT AND EQUIPMENT
(Utilities)
at Beginning of Each Year
Billions of Dollars
Capitalization
Value of Plant and Equipment
Central stations show steady
growth and prosperity
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929

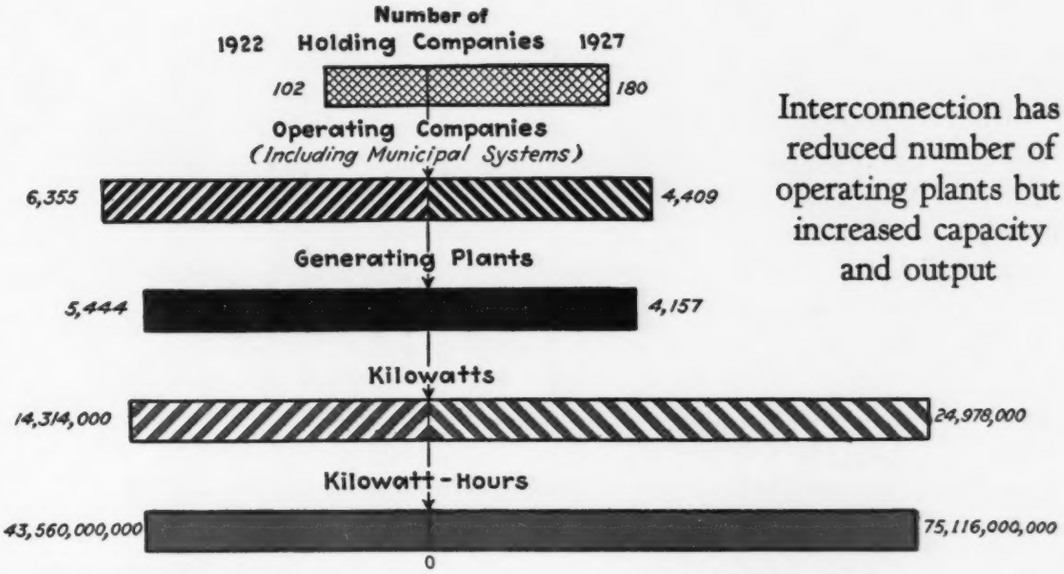

GROSS REVENUE
(Geographically)
Mountain Pacific
South Central
North Central
Atlantic
New England
Millions of Dollars
1922
1923
1924
1925
1926
1927
1928


ENERGY GENERATED
(Geographically)
Mountain Pacific
South Central
North Central
Atlantic
New England
Billions of Kilowatt-Hours
1922
1923
1924
1925
1926
1927
1928

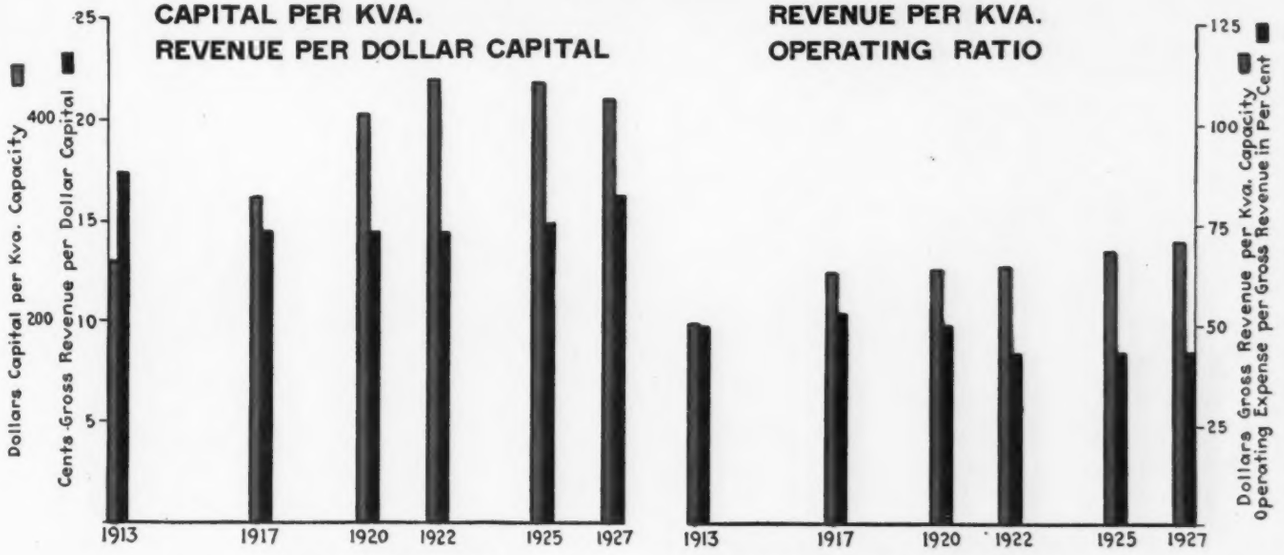

ELECTRIC LIGHT AND POWER
CUSTOMER OWNERSHIP SALES OF STOCK
Millions of Dollars
3,000
2,500
2,000
1,500
1,000
500
$43,000,000
$80,000,000
$130,000,000
$175,000,000
1920 1921 1922 1923 1924 1925 1926 1927
TELEPHONE INVESTMENT
Construction work in progress supplies, tools, etc.
Subscriber's station equipment
Aerial plant
Underground plant
Central office equipment
Land and buildings
1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927

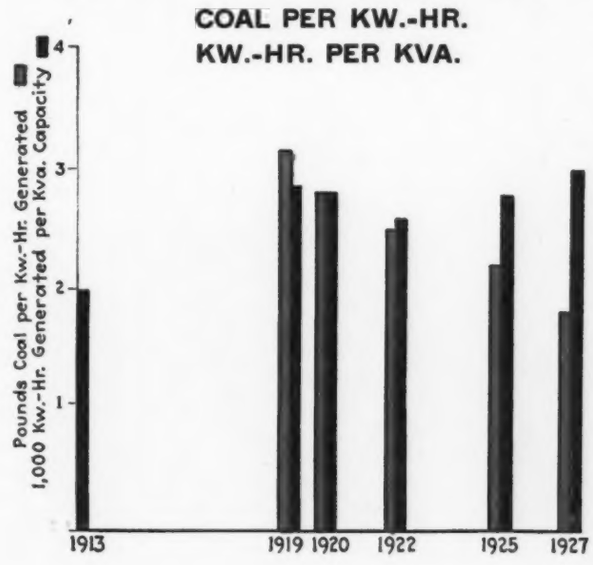

Government 30%
PRIVATE 70%
OWNERSHIP OF WORLD'S TELEPHONES
TELEPHONES PER 100 POPULATION
United States
Europe
Telephones per 100 Population
15
10
5
1875 1880 1885 1890 1895 1900 1905 1910 1915 1920 1925 1930

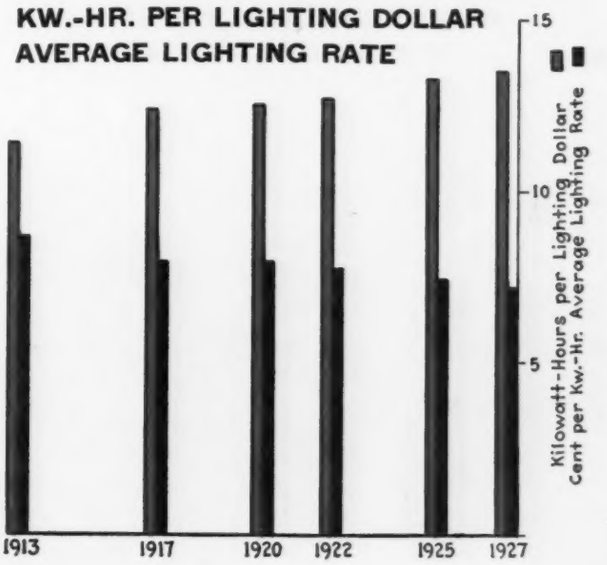

DIVISION OF CUSTOMERS
IN THE LIGHT AND POWER INDUSTRY
NUMBER of CUSTOMERS
By Classes Dec. 31
Industrial Power
Commercial Lighting
Domestic Lighting
1,947,000
8,505,000
10,820,000
12,335,000
16,567,000
19,528,000
21,694,000
1907 1918 1920 1922 1924 1926 1927
25
20
15
10
5
CENTRAL STATION
STOCK SALES
To Customers and Employees
(By Years)
92,310 shares
57,130 shares
38,183 shares
82,007 shares
42,388 shares
194,021 shares
454,139 shares
830,222 shares
1,450,707 shares
1,806,300 shares
2,478,165 shares
2,926,271 shares
2,686,187 shares
3,480,000 shares
(Partly estimated)
1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927
Year

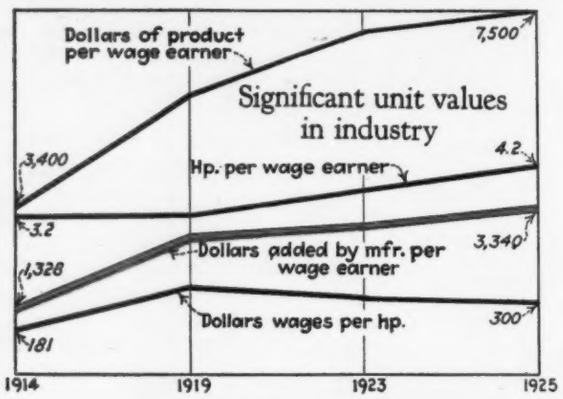


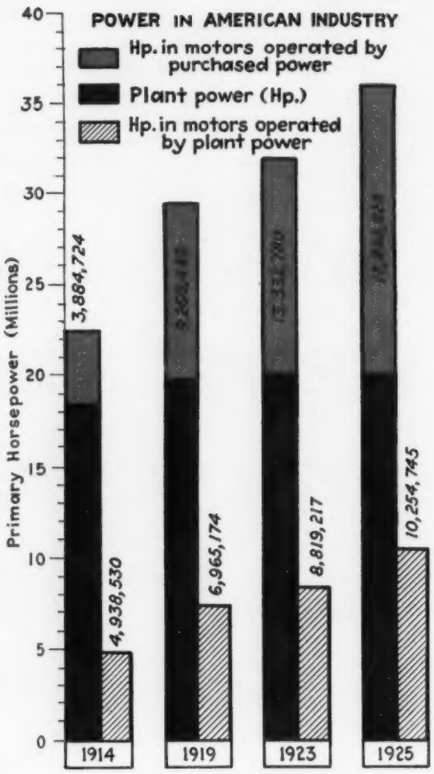
Interconnection has reduced number of operating plants but increased capacity and output

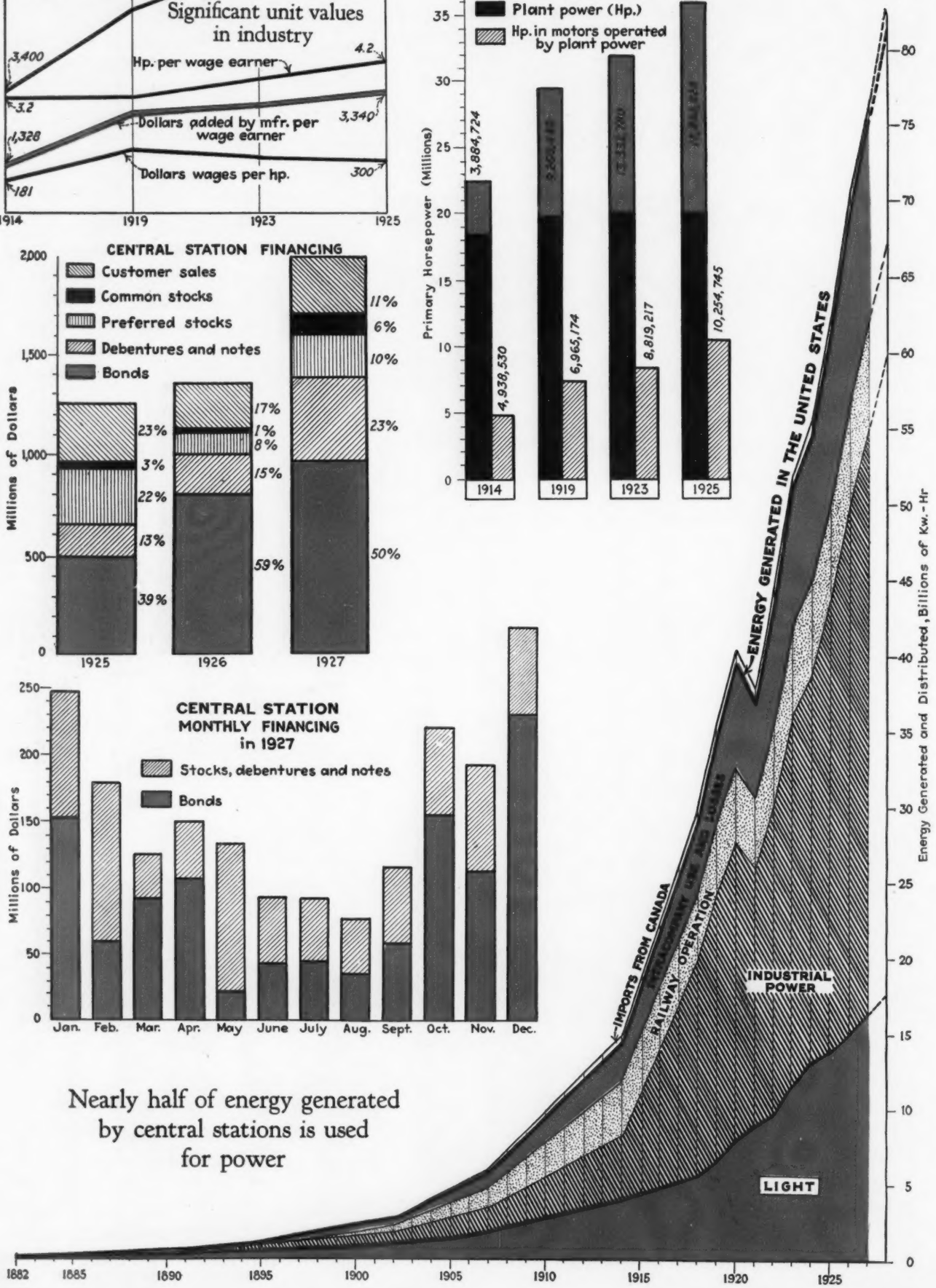












Nearly half of energy generated by central stations is used for power

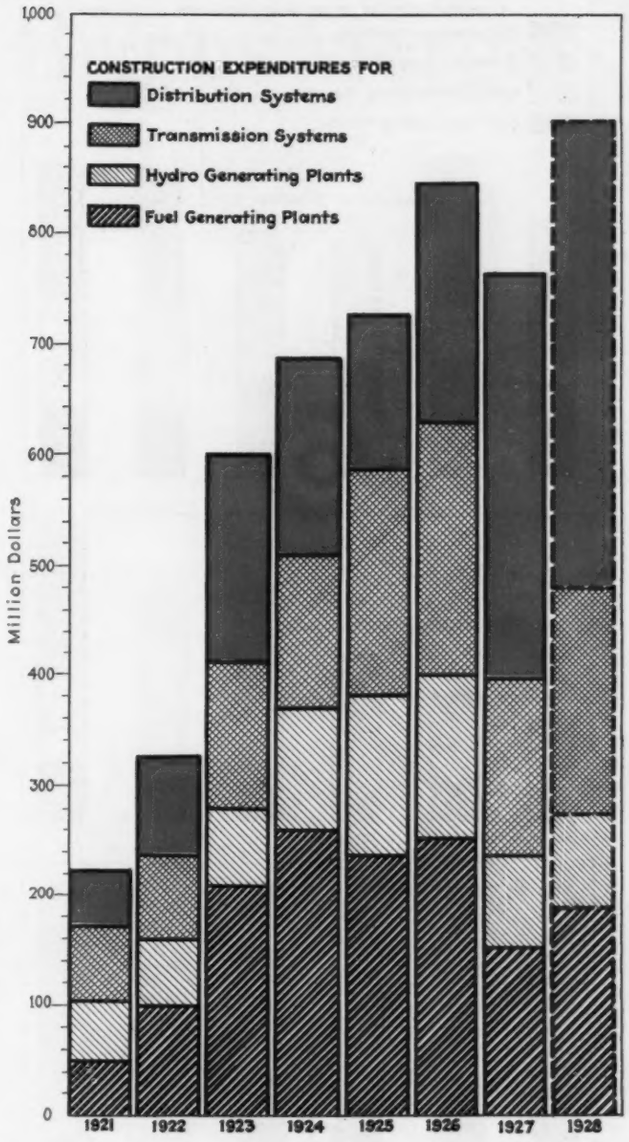
Utility Budget for 1928 $900,363,000

Revival of building indicated. Expenditures in 1927 aggregate $760,353,000. Distribution expenditures predominate

TELEGRAMS to the ELECTRICAL WORLD from light and power companies indicate a budget of $900,363,000 for 1928. This is the largest expenditure for new facilities indicated in the history of the industry and shows that a decrease in spending for 1927 will be compensated for in 1928.

In every section of the country there are increases in budgets, but the Southern states and North Central states lead in increases. If load densities and age are considered, there is no doubt that the Southern states have embarked upon the largest program of expansion.

For several years the larger proportion of expenditures has been for distribution facilities. During 1927 the sum of $362,316,501 was spent on distribution, and in 1928 this sum aggregates $424,042,695. In 1927 the sum of $163,153,380 was spent for transmission, and in 1928 the budget is $203,396,121. In 1927 the sum



MONEY WILL BE SPENT CHIEFLY FOR TRANSMISSION AND DISTRIBUTION BUT STATIONS WILL HAVE SHARE

Table I—Total Value of All Additions and Extensions to Central-Station Generating, Transmission and Distribution Systems from 1922 to 1928

Section	1922	1923	1924	1925	1926	1927	1928
Eastern States	$101,525,000	$211,196,000	$259,850,000	$190,300,000	$200,107,000	$247,961,000	$252,509,000
Southern States	49,805,000	82,105,000	104,460,000	130,500,000	190,500,000	191,190,000	244,340,000
North Central States	96,700,000	206,180,000	218,950,000	260,200,000	280,605,000	213,994,000	274,624,000
Western States	75,986,000	102,662,000	109,180,000	140,300,000	170,132,000	107,208,000	128,890,090
Totals for U. S.	$324,016,000	$602,143,000	$692,440,000	$721,300,000	$841,344,000	$760,353,000	$900,363,000

Table II—Value of Additions and Extensions to Light and Power Company Fuel and Hydro Generating Plants from 1924 to 1928

Section	Fuel-Electric Generating Plants					Hydro-Electric Generating Plants				
	Value of Additions					Value of Additions				
	1924	1925	1926	1927	1928	1924	1925	1926	1927	1928
Eastern States	$94,900,000	$95,000,000	$80,107,000	$53,593,000	$56,613,000	$41,760,000	$15,000,000	$20,000,000	$39,436,000	$27,822,000
Southern States	34,200,000	20,000,000	30,000,000	35,128,000	48,170,000	22,600,000	50,000,000	60,000,000	21,913,000	29,209,000
North Central States	127,500,000	100,000,000	120,000,000	43,585,000	58,984,000	7,200,000	20,000,000	20,000,000	6,020,000	8,961,000
Western States	13,100,000	25,000,000	25,000,000	13,711,000	19,142,000	37,980,000	55,000,000	45,000,000	21,497,000	24,023,000
Totals for U. S.	$269,700,000	$240,000,000	$255,107,000	$146,017,000	$182,909,000	$109,540,000	$140,000,000	$145,000,000	$88,866,000	$90,015,000

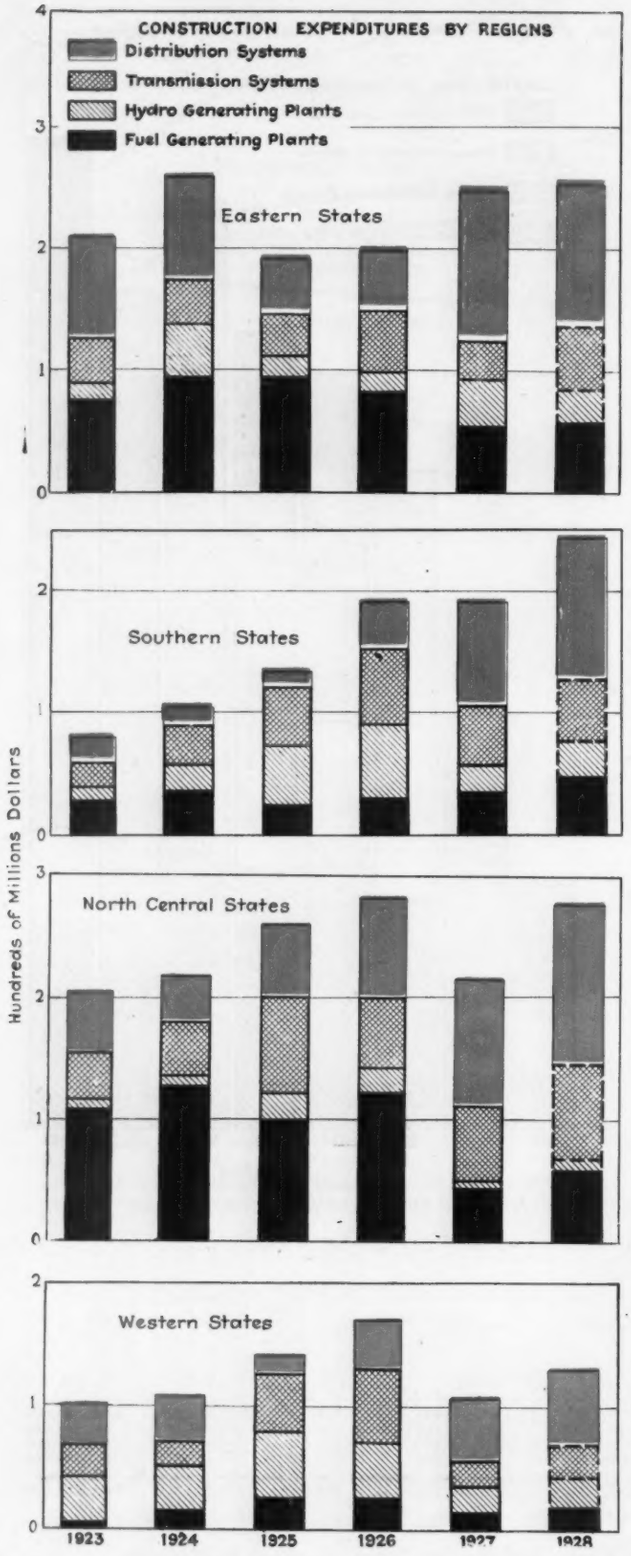


Table III—Segregation of Central-Station Construction Expenditure for Generation and Transmission

Year	Total Central-Station Construction Budgets for Year	Total Expenditures for Electric Generating Plants	Total Expenditures for Transmission and Distribution Systems	Per Cent of Total Spent on Generating Plants	Per Cent of Total Spent on Transmission and Distribution Systems
1921...	$222,408,000	$102,674,000	$119,734,000	46.2	53.8
1922...	324,016,000	164,333,000	159,683,000	50.8	49.2
1923...	602,143,000	283,813,000	318,330,000	47.1	52.9
1924...	692,440,000	379,240,000	313,200,000	54.8	45.2
1925...	721,300,000	380,000,000	341,300,000	52.7	47.3
1926...	841,344,000	400,107,000	441,237,000	47.5	52.5
1927...	760,353,000	234,883,000	525,470,000	30.8	69.2
1928*..	900,363,000	272,924,000	627,439,000	30.3	69.7

*Budget estimates.

of $234,883,000 was spent for generating stations, and the budget for 1928 is $272,924,000.

Expenditures in the utilitiy industry shift in well-recognized cycles. In 1926 expenditures for generating stations and transmission lines reached a peak, and it is logical to expect large expenditures for distribution in 1927 and 1928. When the stations and lines become loaded, another station building period is to be expected that will call for expenditures in excess of those of 1926. But these cycles of building are not extreme, because each year there is a large station building program. Demand for service grows continuously and must be met.

In 1927 a large utility budget was indicated, but many budgets were cut later in the year for divers reasons. Some unsettled political conditions, major efforts to reduce fixed charges, a desire to catch up with the facilities already built and changes in property ownership had an influence to reduce expenditures. But with telegrams from systems sent to the ELECTRICAL WORLD aggregating $800,000,000 for the 1928 budget and with these properties representing only 75 per cent of the generating capacity, it is clearly evident that the light and power industry expects to spend a large sum of money in 1928. Past experience indicates that stopping expenditures during one year merely postpones the day when expenditures commensurate with growth must be made. An example of this is found with one group of properties that spent $44,000,000 in 1927 but has a budget of $106,000,000 for 1928.

In New England the flood damage will result in about $6,000,000 increase in next year's expenditures. In the Middle Atlantic and East-North Central states about $400,000,000 will be spent, with distribution expenditures the largest item. Large expenditures are indicated for the Southern and Southwestern states and between the Mississippi River and the Rocky Mountains. In these regions generating stations will be built in large numbers to supply the needs of these rapidly growing regions.

Table IV—Value of Additions and Extensions to Transmission and Distribution Systems from 1924 to 1928

Section	Transmission Systems — Value of Additions					Distribution Systems — Value of Additions				
	1924	1925	1926	1927	1928	1924	1925	1926	1927	1928
Eastern States.....	$37,070,000	$35,000,000	$50,000,000	$32,147,000	$51,514,000	$86,120,000	$45,300,000	$50,000,000	$122,785,000	$116,560,000
Southern States.....	33,400,000	45,200,000	60,456,000	47,830,000	50,298,000	14,260,000	15,300,000	40,044,000	86,320,000	116,664,000
North Central States	43,930,000	80,200,000	60,605,000	61,055,000	76,816,000	40,320,000	60,000,000	80,000,000	103,334,000	129,862,000
Western States.....	19,790,000	45,300,000	60,000,000	22,121,000	24,768,000	38,310,000	15,000,000	40,132,000	49,878,000	60,957,000
Totals for U. S....	$134,190,000	$205,700,000	$231,061,000	$163,153,000	$203,396,000	$179,010,000	$135,600,000	$210,176,000	$362,317,000	$424,043,000

Interconnection Brings Mergers

Consolidation of light and power properties follows the extension of transmission systems. Trend to group operation and ownership continues. Record of mergers

THE business of grouping utility properties has developed so greatly that the economic and operating advantages can be measured in tangible savings. As a consequence, the light and power industry has been very active with mergers and the regrouping of properties during the last year. Low money rates, because of good utility credit, have helped to bring about consolidations that will return savings, and experience with past operations has brought about a technique of consolidation whereby less speculation has been involved in merger transactions and fewer speculative or amateur operators have attempted to develop holding organizations.

Mergers in the light and power industry are of three or four types. The extension of transmission systems makes it economical to take over small municipal and small private plants adjacent to the extended lines of large utilities. This type of merger has been very active in the South and in the West. Another type of merger is brought about by the purchase of several small properties in different parts of the country. Through consolidated financing and consolidated engineering and management, these properties are tuned up and put on a much more economical basis of operation. Often these properties are later merged into one of the large holding groups. This type of merger has been active in the Southwest and West. Another type of merger has been the formation of a joint control holding company consisting of many small properties, which do not give up their identity or control, but do give to a central organization certain authority for commitments. Massachusetts has developed this type of merger to the greatest extent. There is still another type of merger that has been a recent development and this involves the merging of holding companies themselves and the sale or trade of subsidiary properties, so that each holding company concerned develops a more logical and more profitable grouping of subsidiary properties. During the last year some very large mergers of this type have been made.

SMALL TOWNS OF IOWA AND NEBRASKA HAVE BENEFITED BY INTERCONNECTIONS

During 1927 a total of 828 utility changes occurred. These changes involved direct mergers, change in ownership or change in name and corporate structure. A total of 181 municipal plants were included and these plants were absorbed into large privately owned utilities. This left a total of 647 changes in the corporate name or structure of privately owned properties. States in which municipal plants were taken over to the greatest extent were Georgia, Nebraska, North Carolina and Oklahoma. States in which changes in corporate structures of private plants were carried out to the greatest extent were Massachusetts, New York, North Dakota, Texas, Illinois and Pennsylvania.

There has been great activity in the purchase of small private plants in New England, along the Atlantic seaboard and in the Middle West states. In Georgia, Nebraska, North Carolina and Oklahoma many small municipal plants have been taken over by large transmission systems. The Southeastern Power & Light Company, Middle West Utilities Company, Massachusetts Utilities Investment Trust, Mohawk Hudson Power Corporation and Otter Tail Power Company are holding companies that have been active in purchasing.

The Middle West Utilities Company, through subsidiaries, now serves 1,920 communities in eighteen states with a population estimated at 3,665,000, and, in addition, supplies wholesale energy to 380 other communities with an estimated population of 602,000. It has 204 steam stations and 133 hydro stations to supply energy to a transmission system of 14,454 miles. In Arkansas, Louisiana and Texas, the Southwestern Gas & Electric Company, a subsidiary, has acquired the Gulf States Utilities Company and the East Texas Public Service Company, the eastern Texas properties of the American Public Service Company. In addition, the Southwestern Gas & Electric Company has purchased plants and extended service to Center Point, Cove, DeQueen, Dierks, Foreman, Gillham, Hatfield, Horatio, Locksburg, Mineral Springs, Murfreesboro, Nashville and Winthrop in

Where Major Corporate Changes Occurred in Past 18 Months

The approximate location of each town in which ownership has been changed, or where the utility has been merged with another, or where the holding company has been changed or merged with another is indicated. Towns of less than 2,500 population have not been included. For details the reader is referred to the accompanying tables and the Bonbright survey.

Arkansas. In Oklahoma, the Southwestern Light & Power Co., also a subsidiary, acquired the Elk City and Clinton properties of the Oklahoma Gas & Electric Company and purchased the municipal plants at Bessie, Blair, Fort Cobb, Hinton, Leedy and Martha. The Chickasha Gas & Electric Company has been transferred to this subsidiary.

In Illinois another subsidiary of the Middle West Utilities Company, the Central Illinois Public Service Company, purchased plants at Chesterfield, Hardin and Littleton and the municipal plant at Granville. Other subsidiaries that have been active in extending their systems are the Illinois Northern Utilities, the Interstate Public Service Company in Indiana, the Central Power Company in Nebraska, the Southern New Hampshire Hydro-Electric Company, the New England Public Service Company, the Kentucky Utilities Company, the West Texas Utilities Company, the Central Power & Light Company and the Wisconsin Power & Light Company. The Middle West Utilities Company acts as the financial agent for the subsidiaries and as a consultant in operation and management.

In Oklahoma, the Public Service Company of Oklahoma, a subsidiary of the Middle West Utilities Company, has been active. It has under construction a steam station at Weleetka, which will eventually be connected by a 66,000-volt transmission line with the West Tulsa plant of the Oklahoma Power Company. The Public Service Company sold Guthrie, Mulhall, Langston, Perkins, Coyle and Vinco to the Oklahoma Gas & Electric Company and purchased the Oklahoma Power Company of Okmulgee. These and other changes secured a better arrangement of properties for both the Public Service Company and the Byllesby properties in that state. Interconnections and energy in exchanges between the Public Service Company and the Oklahoma Gas & Electric Company have been arranged that will be advantageous to both properties.

U.G.I. Expands Greatly

The United Gas Improvement Company greatly extended its utility holdings during the last year, chiefly through purchased control of Day & Zimmermann and the Philadelphia Electric Company. Early in the year, Day & Zimmermann acquired part of the A. E. Fitkin utility interests. The most important properties in the Fitkin group were under the holding of National Public Service Corporation and are the Jersey Central Power & Light Company, Virginia Public Service Company, Tide Water Power Company, Florida Power Corporation, Municipal Service Company, Eastern Shore Gas & Electric Company and numerous subsidiaries. The National Public Service served a population of 1,256,000 in 621 communities. Later the National Public Service was acquired by the Insull interests who thus control all of the Fitkin properties. The U. G. I. Company expanded its holdings in the West, where the Iowa Public Service Company, a subsidiary, acquired the Central Iowa Power & Light Company and the Iowa Light, Heat & Power Company.

In the Philadelphia area, the U. G. I. Company merged the Counties Gas & Electric Company, the Philadelphia Suburban Gas & Electric Company and sixteen smaller units into the Philadelphia Suburban Counties Gas & Electric Company, and recently acquired sufficient stock to control the Philadelphia Electric Company, one of the oldest and largest metropolitan utilities. In Nebraska, the U. G. I. has purchased properties at McCook and Gothenburg. These developments, together with properties already held, place the United Gas Improvement Company in the front rank of large holding organizations.

The Standard Gas & Electric Company sold the Sierra & San Francisco Power Company, the Western States Gas & Electric Company and the Coast Valleys Gas & Electric Company to the Pacific Gas & Electric Company, thus giving the last-named company properties in northern California that will help greatly in making a unified system for further power development. The Oklahoma Gas & Electric Company has co-operated with the Public Service Company of Oklahoma in the rearrangement of holdings in that state. It purchased the Gage and Shattuck plants from the Southwestern Light & Power Company, six plants from the Public Service Company and three municipal plants. This company has added greatly to its generating capacity and transmission system during the year.

MUNICIPAL AND PRIVATE PLANTS SOLD IN 1927

State	Number of Plants Private	Number of Plants Municipal	State	Number of Plants Private	Number of Plants Municipal
Alabama	5	4	Nebraska	23	22
Arizona	5	...	New Hampshire	4	...
Arkansas	12	3	New Jersey	12	2
California	9	...	New Mexico	2	...
Colorado	11	3	New York	52	1
Connecticut	7	...	North Carolina	5	18
Delaware	2	5	North Dakota	31	8
Florida	4	7	Ohio	19	...
Georgia	19	12	Oklahoma	11	15
Idaho	7	...	Oregon	10	2
Illinois	28	4	Pennsylvania	24	1
Indiana	23	1	South Carolina	3	2
Iowa	13	10	South Dakota	9	8
Kansas	16	10	Tennessee	6	4
Kentucky	5	2	Texas	30	7
Louisiana	4	6	Vermont	7	1
Maryland	15	1	Virginia	10	4
Massachusetts	65	...	Washington	4	1
Michigan	19	1	West Virginia	3	...
Minnesota	14	5	Wisconsin	20	3
Mississippi	2	6			
Missouri	20	1			
Montana	3	1	Total	593	181

In the utility groups associated with the Electric Bond & Share Company, several changes have occurred. The Arkansas Power & Light Company acquired four private plants and three municipal plants, and now serves 107 communities. The Louisiana Power & Light Company acquired the Winnsboro municipal plant, and the Mississippi Power & Light Company took over the municipal plants at Carrollton, Isola and Tupelo. The Nebraska Power Company acquired the electric light and power properties of the Omaha and Lincoln Railway & Light Company. It has taken over several municipal plants, has purchased several properties from the Central West Public Service Company and has extended service to several communities near its transmission lines. The Pacific Power & Light Company, the Texas Power & Light Company, the Houston Lighting & Power Company and the Northwestern Electric Company extended service to private and municipal plants in their respective service areas.

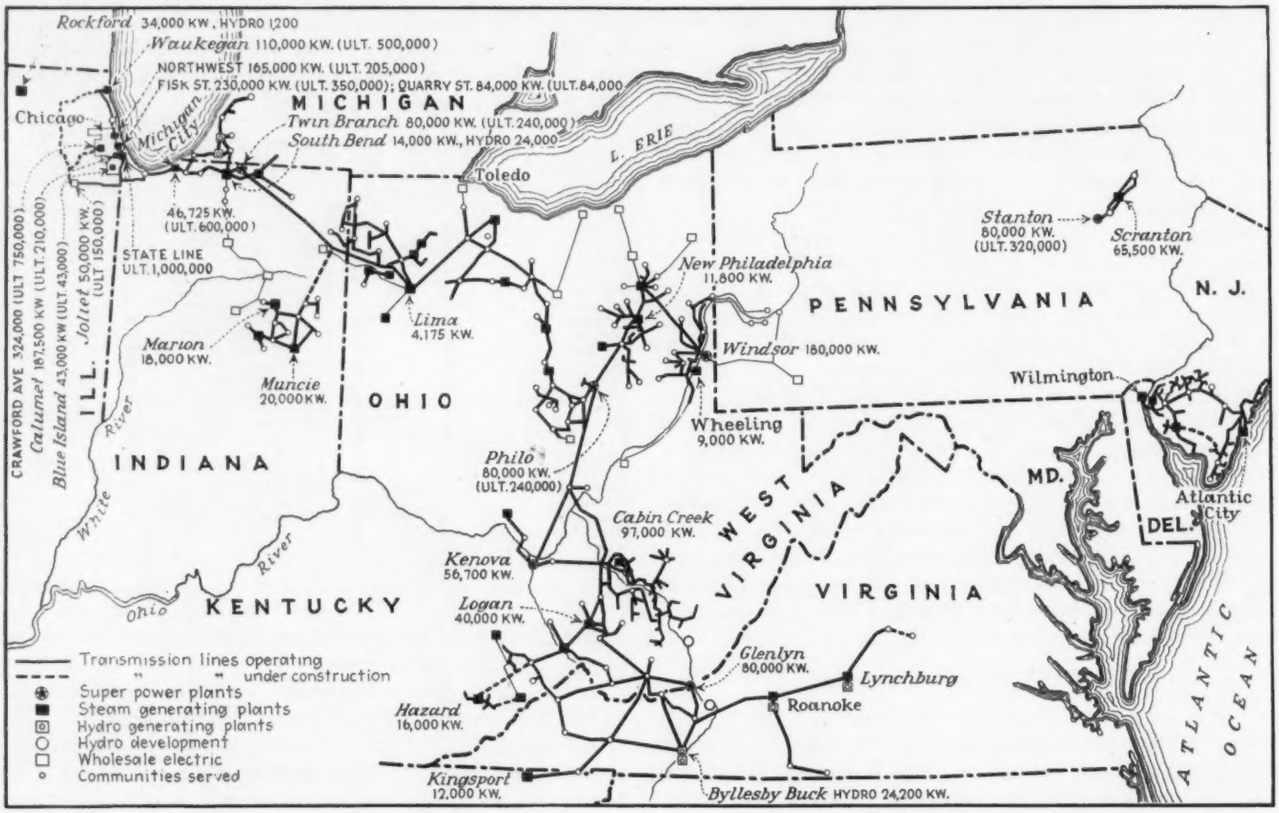
The Southeastern Power & Light Company has been co-ordinating its large system and extending transmission lines into new territory. The Alabama Power Company has purchased a number of properties, including the Gulf Electric Company and the Houston Power Company. The Georgia Power Company acquired Ball Ground, Chamblee-Camp Gordon and eight municipal plants. It merged the properties of the former Georgia Power Company and the Georgia Light, Power & Railways into a co-ordinated unit.

The new company supplies the industrial area of central and northern Georgia, including 89 communities served directly and 48 municipalities that purchase power at wholesale. New transmission lines are being built to interconnect the different Southeastern properties and generating capacity is being added at a rapid rate.

In the American Gas & Electric Company group, the Indiana & Michigan Electric Company of South Bend has bought the Allen County Electric Light & Power Company and the Indiana Power & Light Company. The Atlantic City Electric Company has acquired the Atlantic County Electric Company and the Electric Company of New Jersey, which serves all of southern New Jersey below Camden and Woodbury, and west of the West Jersey & Seashore Railroad.

In the East several changes in utility groupings have occurred of major magnitude. The New York Power & Light Corporation was formed by the merger of seven utilities which are subsidiaries of the Mohawk Hudson Power Corporation. The total population served is more than 750,000 and the generating capacity of the system is 230,840 kw. The Massachusetts Utilities Investment Trust was formed by 45 utilities affiliated with the Massachusetts Lighting group and of voluntary associations of groups holding utility shares. The controlled companies serve 94 communities with a population of 600,000. Insull, Son & Company acquired control of the National Electric Power Company, which operates properties in Maine, Pennsylvania, Nebraska, Ohio, Indiana, Michigan, South Dakota, Kansas, Oklahoma and Arkansas, including the Cumberland County Power & Light Company of Portland, Me., the Penn Central Light & Power Company, the Kansas Electric Power Company and others serving a population in excess of 1,125,000 in more than 450 communities. Other important acquisitions of Insull, Son & Company were the Inland Power & Light Corporation, which serves 320 communities in five states and the Western United Gas & Electric Company in southern Illinois. The latest acquisition of the Insulls was the National Public Service Corporation, a former Fitkin property serving 621 communities in Pennsylvania, Florida, Virginia, New Jersey and Georgia and elsewhere with electricity, gas, railway, ice and other services.

Many other changes in utility ownership will be found in the accompanying tables. Some of these changes involve change in ownership, others are mergers under one control and still others represent changes in corporate name and corporate groupings of properties. It is evident that consolidation of utility properties proceeds apace and that the extension of large transmission systems inevitably results in taking over small properties that can be served more economically from large systems.



INTERCONNECTION HAS AFFORDED TERRITORY SOUTH OF THE GREAT LAKES THE BENEFITS OF LARGE MODERN STATIONS

Holding Company Mergers in 1927

Company Involved	Acquiring Company	Holding Company	Date of Merger
American Comwealth Pwr.Corp.	American States Sec. Corp.	6	*Jan.
American Electric Power Co.	Pennsylvania Gas & Elec. Corp.	1	*Oct.
American Power Co. (a)	Pennsylvania Gas & Elec. Corp.	1	*Oct.
Baltimore Corp. of Maryland	Consolidated Gas Electric Light & Power Co. of Baltimore		*June
Central Massachusetts Light & Power Co	Massachusetts Util. Inv. Trust	71-55	*May
Central Public Utility Co.	Central Public Utilities Corp.	13	*Mar.
Central West Public Service Co.: Bennington, Elkhorn, Waterloo, Valley, LeShara, Yuban, Elk City & Hooper; wholesale to Mead, Washington, Kennard & Herman, Neb.	Nebraska Power Co.	5-30	*Sept.

Company Involved	Acquiring Company	Holding Company	Date of Merger
American Superpower Corp.§	American Comwlths. Pwr. Corp.	6	*Jan.
Comwlth. Gas & Elec. Cos	Massachusetts Util. Inv. Trust	71–55	*May
Commonwealth Power Corp.§	American Comwlths. Pwr. Corps.	6	*Jan.
Commonwealth Utilities Corp.	Troy, Graham & Co., Chicago	85	*April
Community Pwr.&Lt. Co. (Del.)	American Comwlths. Pwr. Corp.	6	*June
Community Pwr. & Lt. Co. (Ill.)	Community Pwr. & Lt. Co. (Del.)	6	Feb.
Day & Zimmermann, Inc.	United Gas Improvement Co.	87	*June
Dierks Lumber & Coal Co.: Arkansas: Center Point, Cove, DeQueen, Dierks, Foreman, Gillham, Hatfield, Horatio, Locksburg, Mineral Springs, Murphreesboro, Nashville and Winthrop	Southwestern Gas & Elec. Co.	56	*Oct.
Oklahoma: Broken Bow, Idabel, Oak Hill, Pine Village, Talihina, Vallient, and Wright City	Public Serv. Co. of Oklahoma	56	*Oct.
Eastern Shore Gas & Electric Co. (*o e*)	Day & Zimmermann, Inc.	62–42–24–87	*Mar.
Eastern States Utilities Co. (*a*)	American Electric Power Corp.	1	*Oct.
Electric Public Service Co. (*g*)	Electric Public Utilities Co.	33	Mar.
Electric Securities Co. (*a*)	Pennsylvania Gas & Elec. Corp.	1	*Oct.
Federated Utilities	Federated Utilities, Inc.	14	Feb.
Gas & Elec. Improvement Co. (*m*)	Massachusetts Util. Inv. Trust	71–55	May
Georgia Light, Power & Rys.	Georgia Power Co.	80	†
Inland Power & Light Corp.	Insull Son & Co., Inc.	21–46	*Oct.
Interstate Elec. Corp. (dissolved)	Inland Power & Light Corp.	21–46	*June
Keystone Pub. Serv. Corp. (*o e*)	Day & Zimmermann, Inc.	62–42–24–87	*Mar.
Laclede Gas & Electric Co.	Utilities Power & Light Corp.	93	*May
Light, Heat & Power Corp. (*h m*)	Massachusetts Util. Inv. Trust	71–55	May
Maryland East Coast Util. Co.	East Coast Utilities Co.	27	*Nov.
Maryland Securities Co.	Consolidated Gas Electric Light & Power Co. of Baltimore		Feb.
Massachusetts Lighting Cos.	Massachusetts Util. Inv. Trust	71–55	May
Maysville Public Service Co.	Kentucky Power Co.		*April
Montreal Tramways & Pwr. Co.	Consolidated Securities, Ltd.	90	†
Municipal Service Co. (*e*)	Day & Zimmermann, Inc.	62–42–24–87	*Mar.
National Power & Light Co.§	American Comwlths. Pwr. Corp.	6	*Jan.
National Public Service Corp.	Day & Zimmermann, Inc.	42–24–87	*Mar.
National Public Service Corp§	United Gas Improvement Co.	87	*April
National Public Service Corp.	Insull, Son & Co., Inc.	21–46	*Dec
New England Power Assn.§	Massachusetts Util. Inv. Trust	71–55	May
Northeastern Power Corp.	St. Regis Paper Co.	78	*June
Old Colony Lt. & Pwr. Associates	Massachusetts Util. Inv. Trust	71–55	*May
Penn-Ohio Edison Co.	Penn-Ohio Securites Corp.	72	*Mar.
Pennsylvania Gas & Elec. Corp.	American Electric Power Corp.	1	*Oct.
People's Light & Power Corp.	G. L. Ohrstrom & Co.	69	*April
Porto Rico Railways Co., Ltd.	Int'l Power Co., Ltd. (Canada)	49	*April
Power Corp. of New York (*p*)	St. Regis Paper Co.	78	*June
Power & Elec. Sec. Corp. (*p*)	St. Regis Paper Co.	78	*June
Public Utilities Consol. Corp.	W. B. Foshay Co.	40	*June
South American Power Co.	American & Foreign Power Co., Inc.	2–30	*Oct.
Southern Cities Utilities Co.	United Utilities & Service Corp.	92	*Mar.
Southern Gas & Power Corp.	Central Public Service Corp.	14	*Mar.
United Light & Power Co.§	American Comwlths. Pwr. Corp.	6	*Jan.
United Public Utilities Co.	United Public Service Co.	89	Feb.
United Public Utilities, Inc.	Southern Cities Utilities Co.	92	*Mar.
Utilities Shares Corp.§	American Comwlths. Pwr. Corp	6	*Jan.
Western United Corp.	E. H. Rollins & Sons	77	*April

Utility Mergers and Purchases in 1927

Alabama

Company Involved	Acquiring Company	Holding Company	Date of Merger
Citizens' Water, Lt. & Pwr. Co.	Alabama Power Co.	80	*May
Gulf Electric Co.	Alabama Power Co.	80	*Nov.
Houston Power Co.	Alabama Power Co.	80	*Nov.
Monroeville Ice & Power Co.	Gulf Utilities Co.		*July
Pea River Power Co. (Gov. Chas. Henderson)	Col. C. A. O'Neal		*Sept.
Bay Minette Municipal Lighting Plant & Distribution System	¶Gulf Electric Co.	80	*Oct.
Geneva Municipal Ltg. Plant	¶Gulf Electric Co.	80	*Nov.
Gordo Municipal Light & Power Plant	Alabama Power Co.	80	*Jan.
Jackson Municipal System	Alabama Power Co.	80	*Feb.

Arizona

Company Involved	Acquiring Company	Holding Company	Date of Merger
Desert Power & Water Co.	Public Utilities Consol. Corp.	76–40	*Aug.
Miami Water & Power Co.	People's Arizona Gas & Elec. Corp. (*t*)	68	*Nov.
People's Arizona Gas & Elec. Corp (*t*)	G. L. Ohrstrom & Co.	68	*April
Southern Arizona Power Co.	Public Utilities Consol. Corp.	76–40	*April

Arkansas

Company Involved	Acquiring Company	Holding Company	Date of Merger
Arkansas-Missouri Pwr. Co. (*j*)	Insull Son & Co., Inc.	21–46	*June
Arkansas Public Service Co.	Arkansas-Missouri Pwr Co.	21–46	†
Arkansas Utilities Co. (*b*)	American Cmwlths. Pwr. Corp.	6	*June
Bradford Power Plant	Arkansas Power & Light Co.	32–30	*Aug.
DeQueen Lt. & Pwr. Co. (Dierks Lumber & Coal Co.)	Southwestern Gas & Elec. Co.	56	*Oct.
Dierks Lumber & Coal Co. See Holding Company Mergers under	Southwestern Gas & Elec. Co.	56	*Oct
Foreman Lt. & Pwr. Co. (Dierks Lumber & Coal Co.)	Southwestern Gas & Elec. Co.	56	*Oct.
Gould Electric Plant	Arkansas Power & Light Co.	32–30	*July
Home Lt. & Pwr. Co. (Dierks Lumber & Coal Co.)	Southwestern Gas & Elec. Co.	56	*Oct.
Nashville Ice, Coal & Light Co. (Dierks Lumber & Coal Co.)	Southwestern Gas & Elec. Co.	56	*Oct.
Walnut Lake Electric Plant	Arkansas Power & Light Co.	32–30	*July
Winchester Electric Plant	Arkansas Power & Light Co.	32–30	*July
Batesville Light & Water Improvement District	Arkansas Power & Light Co.	32–30	*May
Dumas Munic. Wtr. & Lt. Plant	Arkansas Power & Light Co.	32–30	*July
Tillar Municipal Elec. Lt. Plant	Arkansas Power & Light Co.	32–30	*July

California

Company Involved	Acquiring Company	Holding Company	Date of Merger
Central Mendocino Power Co.	W. B. Foshay Co., Minneapolis	40	*July
Coast Valleys Gas & Elec. Co.	Pacific Gas & Electric Co.	70	*May
McKinley Bros., Inc. (Middletown)	California Tele. & Lt. Co.	70	*June
People's California Hydro-Electric Corp. (*t*)	G. L. Ohrstrom & Co.	68	*April
Public Utilities California Corp.	Public Utilities Consol. Corp.	76–40	*Aug.
Santa Cruz County Utilities Co.	Public Utilities California Corp.	76–40	†
Sierra & San Francisco Pwr. Co.	Pacific Gas & Electric Co.	70	*May
Vacaville Water & Power Co.	Pacific Gas & Electric Co.	70	*Oct.
Western States Gas & Elec. Co.	Pacific Gas & Electric Co.	70	*May

Colorado

Company Involved	Acquiring Company	Holding Company	Date of Merger
Arapahoe Elec. Lt. & Pwr. Co.	Colorado Central Pwr. Co. (*g*)	33	*Jan.
Arvada Electric Co.	Colorado Central Pwr. Co. (*g*)	33	*Jan.
Buena Vista Elec. Lt. & Pwr. Co.	General Ice & Storage Corp.		*May
Castle Creek Water Co.	Roaring Fork Water, Light & Power Co.		*Nov.
Clear Creek Power & Development Co	Public Service Co. of Colorado	19	*Sept.
Colorado Central Power Co.	Electric Public Service Co.	33	*Jan.
Colorado Utilities Corp.	Central States Pub. Serv. Co.	17–85	*Feb.
Empire Electric Service	Public Serv. Co. of Colorado	19	*Sept.
Fort Lupton Power & Light Co.	Colorado Central Power Co. (*g*)	33	*Jan.
Jefferson County Pwr. & Lt. Co.	Colorado Central Power Co. (*g*)	33	*Jan.
Roaring Fork Electric Light & Power Co	Roaring Fork Water, Light & Power Co.		*Nov.
Akron Municipal Light Plant	Comwlth. Utilities Corp.,	23–85	*April
Limon Municipal Light Plant	Comwlth. Utilities Corp.,	23–85	*April
Simla Municipal Electric Light Plant	Comwlth. Utilities Corp.,	23–85	*Sept.

Connecticut

Company Involved	Acquiring Company	Holding Company	Date of Merger
Danbury Pwr. & Transp. Co.	Danbury & Bethel Gas & Elec. Co.	19	*Nov.
Danielson Light & Power Co.	Eastern Connecticut Power Co., Norwich	87	*April
Lyme Electric Power Co.	Eastern Connecticut Power Co., Norwich	87	*April
Ousatonic Water Power Co.	Connecticut Elec. Service Co.	87	*Jan.
Putnam Light & Power Co.	Eastern Connecticut Power Co., Nowrich	87	*April
Rockville-Willimantic Ltg. Co.	Eastern Gas & Elec. Sec. Corp.	28	*Feb.
Waterbury & Milldale Tramway Co. (Lt. & Pwr. properties)	Connecticut Light & Power Co., Waterbury	87	June

Delaware

Company Involved	Acquiring Company	Holding Company	Date of Merger
New Castle County Elec. Co. (*a*)	Pennsylvania Gas & Elec. Corp.	1	*Oct.
Wilmington Lt. & Pwr. Co. (*a*)	Pennsylvania Gas & Elec. Corp.	1	*Oct.
Dagsboro Municipal Electric Lighting Plant	Eastern Shore Gas & Elec. Co.	62–	*Mar.
Frankford Municipal Electric Lighting Plant	Eastern Shore Gas & Elec. Co.	42–	*Mar.
Millsboro Municipal Electric Lighting Plant	Eastern Shore Gas & Elec. Co.	24–	*Mar.
Selbyville Municipal Electric Lighting Plant	Eastern Shore Gas & Elec. Co.	87–	*Mar.
Smyrna Municipal Electric Lighting Plant	Eastern Shore Gas & Elec. Co.		*Mar.

(*a*) Through American Electric Power Co.
(*b*) Through Community Power & Light Co. (Del.)
(*c*) Through Central Massachusetts Lt. & Pwr. Co.
(*d*) Through Commonwealth Gas & Elec. Companies.
(*e*) Through National Public Service Corp.
(*f*) Through Eastern Shore Gas & Elec. Co. (*o, e*).
(*g*) Through Electric Public Service Co.
(*h*) Under management of Gas & Electric Improvement Co. (*m*).
(*i*) Through Georgia Light, Power & Railways.
(*j*) Through Inland Power & Light Corp.
(*k*) Through Laclede Gas & Electric Co.
(*l*) Through Light, Heat & Power Corp. (*m*).
(*m*) Through Massachusetts Lighting Companies.
(*n*) Through Maysville Public Service Co.
(*o*) Through Municipal Service Co. (*e*)
(*p*) Through Northeastern Power Corp.
(*q*) Through Power & Electric Securities Corp. (*p*).
(*r*) Through Old Colony Light & Power Associates
(*s*) Through Pennsylvania Gas & Electric Corp.
(*t*) Through People's Light & Power Corp.
(*u*) Through Porto Rico Railways Co., Ltd.
(*v*) Through United Utilities & Service Corp.
(*w*) Through Western United Corp.
(*x*) Through Southwestern Power & Light Co.
(*y*) Through Wisconsin Valley Electric Co.
(*z*) Through Penn-Ohio Edison Co.

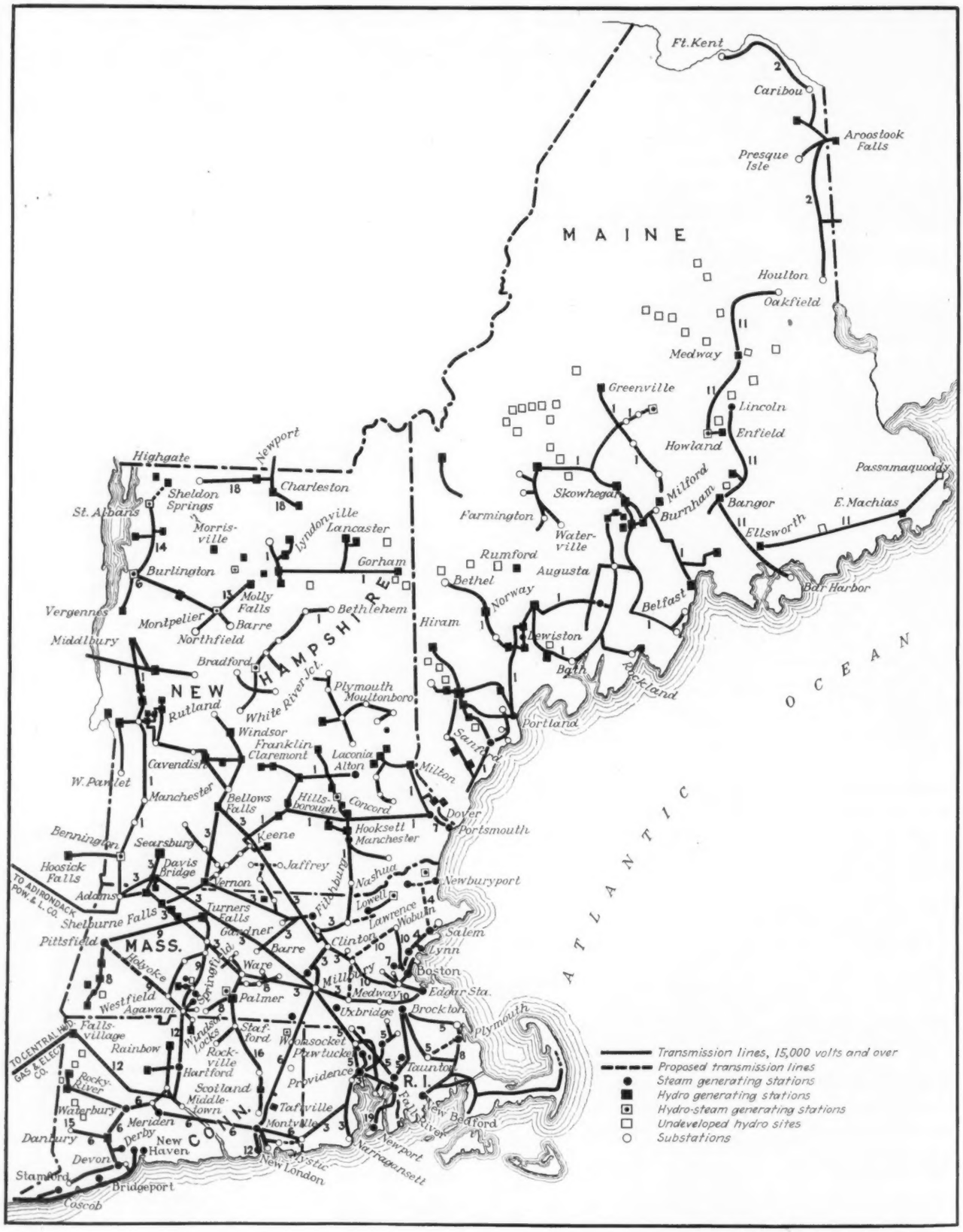
ELECTRICAL DEVELOPMENTS IN THE SOUTH ARE BASED ON INTERCONNECTION

Company Involved	Acquiring Company	Holding Company	Date of Merger
Florida			
Central Florida Pwr. & Lt. Co...	Florida Power Corp. (e).....	62–42–24–87	*Mar.
Florida Power Corp. (e).....	Day & Zimmermann, Inc.....	24–87	*Mar.
Jacksonville Gas Co.....	American Comwlths. Pwr. Corp.	6	June
Pinellas County Power Co.....	Florida Power Corp. (e).....	62–42–24–87	*Mar.
Fernandina Municipal Electric & Water Utilities & Ice Plant...	Southern States Power Co.....	.....	*Mar.
Greenville Municipal Elec. Plant Havana Municipal Elec. Plant... Jennings Munic. Elec. Plant....	West Florida Power Co., Tallahassee.....	62–42–24–87	Feb.
Milton Munic. Lt. & Pwr. Plant..	Gulf Power Co.....	24–87	*April
White Springs Municipal Electric Light Plant.....	West Florida Power Co., Tallahassee.....	62–42–24–87	Feb.
Winter Park Municipal Light & Water Plant.....	Florida Pub. Serv. Co., Orlando	10–43	*June
Georgia			
Athens Railway & Electric Co..	Georgia Power Co.....	80	*Feb.
Atlanta Coach Co.....	Georgia Power Co.....	80	Feb.
Atlanta Northern Railway Co...	Georgia Power Co.....	80	Feb.
Ball Ground Distr. Sys. & Wtr. Pwr. Plant.....	Georgia Power Co.....	80	*July
Butler Light & Power Co. Distribution Systems.....	South Georgia Power Co.....	82	*Jan.
Central Georgia Power Co. (i)..	Georgia Power Co.....	80	*Feb.
Central Georgia Transmission Co. (i).....	Georgia Power Co.....	80	*Feb.
Chamblee-Camp Gordon Water, Light & Power Co.....	Georgia Power Co.....	80	*Oct.
Charlton County Power Co.....	Kentucky Power Co., Augusta, Ky.....	.....	*April
East Georgia Power Co.....	Georgia Power Co.....	80	*Feb.
Georgia Public Service Corp. (i)	Georgia Power Co.....	80	*Feb.
Georgia Railway & Electric Co..	Georgia Power Co.....	80	*Feb.
Georgia Railway & Power Co...	Georgia Power Co.....	80	*Feb.
Macon Gas Co. (i).....	Georgia Power Co.....	80	*Feb.
Macon Railway & Light Co. (i).	Georgia Power Co.....	80	*Feb.
Mutual Light & Water Co.....	Georgia Power Co.....	80	*Feb.
Rome Railway & Light Co.....	Georgia Power Co.....	80	*Feb.
Valdosta Lighting Co. (o e).....	Day & Zimmermann, Inc.,	24–87	*Mar.
Ware County Lt. & Pwr. Co. (o e)	Day & Zimmermann, Inc.,	24–87	*Mar.
Camilla Municipal Plant.....	Baker County Pwr. Co., Newton	.....	*Mar.
Cohutta Munic. Elec. Plant....	Georgia Power Co.....	80	*April
McRae Municipal Electric Light, Wtr., Ice & Cold Storage Plant	Central Georgia Power Co. (i)..	80	*May

SYMBOLS
||Supervisory or management company.
‡Operating company.
*Items appeared in ELECTRICAL WORLD
†Definite date not known.
¶Has since been absorbed.
§Minority interest.

HOLDING COMPANIES
1 American Electric Power Corp.
2 American & Foreign Power Co., Inc. (30)
3 American Gas & Electric Co.
4 American Light & Traction Co.
5 American Power & Light Co (30)
6 American States Securities Corp.
7 American Utilities Co. (41)
8 American Water Works & Electric Co., Inc.
9 Associated Gas & Electric Co. (95)
10 Atlantic Public Utilities, Inc. (96)
11 W.S. Barstow Management Association, Inc. (43)||
12 Buffalo, Niagara & Eastern Power Corp.
13 Byllesby Engineering & Management Corp. (81)||
14 Central Public Service Co. (A. E. Peirce)
15 Central States Edison Co. (E. A. Shrider)
16 Central States Power & Light Corp.
17 Central States Public Service Co. (85)
18 Chandler & Co., Inc. (50)||
19 Cities Service Co. (Doherty)
20 Columbia Gas & Electric Corp.
21 Commonwealth Light & Power Co. (46)
22 Commonwealth Power Corp. (45)
23 Commonwealth Utilities Corp. (85)
24 Day & Zimmermann, Inc. (87, 62-42)||
25 Drake-Jones Co. or Drake-Jones Investment Co.
26 Duke Power Co.
27 East Coast Utilities Co.
28 Eastern Gas & Electric Securities Corp.
29 Eastern Power Co.
30 Electric Bond & Share Co. (2, 5, 32, 52, 61)||
31 Electric Management & Engineering Corp (60)||
32 Electric Power & Light Corp. (30)
33 Electric Public Utilities Co.
34 Empire Power Corp. (74)
35 Engineers' Public Service Corp. (82)
36 Federal Light & Traction Co.
37 Federal Public Utilities Co.
38 Federal Water Service Co.
39 Foreign Power Securities Corp.
40 W. B. Foshay Co. (76)
41 Gannett, Seelye & Fleming Inc., (7, 86)||
42 General Engrg. & Management Corp. (62, 24)||
43 General Gas & Electric Corp. (11)
44 General Utilities & Operating Corp.||
45 Hodenpyl, Hardy & Co. (22)||
46 Insull Son & Co., Inc. (21)
47 International General Electric Co.
48 International Paper Co.
49 International Power Co., Ltd.
50 International Utilities Corp. (18)
51 A. B. Leach & Co., Inc. (54)||
52 Lehigh Power Securities Corp. (30)
53 Long Island Lighting Co.‡
54 McGraw Electric Co. (51)
55 Massachusetts Utilities Investment Trust (71)
56 Middle West Utilities Co.
57 Minnesota Northern Power Co.
58 Mohawk Hudson Power Corp.
59 Mohawk Valley Co.
60 National Electric Power Co. (31)
61 National Power & Light Co. (30)
62 National Public Service Corp. (42; 24, 87)
63 Nevada California Electric Corp.
64 New England Power Association
65 North American Co. (The)
66 North American Light & Power Co.
67 Northeastern Power Corp. (78)
68 G. L. Ohrstrom & Co.||
69 Otter Tail Power Co. of Delaware
70 Pacific Gas & Electric Co.‡
71 C. D. Parker & Co., Boston (55)||
72 Penn-Ohio Securities Corp.
73 People's Light & Power Corp. (68)
74 E. L. Phillips Interests (34)||
75 Public Service Corporation of New Jersey
76 Public Utilities Consolidated Corp. (40)
77 E. H. Rollins & Sons.||
78 St. Regis Paper Co. (67)
79 Shawinigan Water & Power Co.‡
80 Southeastern Power & Light Co.
81 Standard Gas & Electric Co. (13)
82 Stone & Webster, Inc. (35)||
83 Charles H. Tenney & Co.||
84 Texas-Louisiana Power Co.‡
85 Troy, Graham & Co. (17, 23)||
86 Union Electric & Gas Co. (41)
87 United Gas Improvement Co. (24)
88 United Light & Power Co.
89 United Public Service Co.
90 United Securities, Ltd.
91 United States Electric Power Corp.
92 United Utilities & Service Corp.
93 Utilities Power & Light Corp.
94 Western Massachusetts Companies
95 J. G. White Management Corp. (9)||
96 C. W. Young (10)||
|| Supervisory or management company.
‡ Operating company.

Company Involved	Acquiring Company	Holding Company	Date of Merger
Metter Municipal Light Plant..	Georgia Power Co.....	80	*April
Millen Municipal Distr. Sys....	Georgia Power Co.....	80	*July
Sale City Municipal Plant.....	Baker County Pwr. Co., Newton	.....	*Mar.
Statesboro Municipal Elec. Sys..	Georgia Power Co.....	80	*April
Stillmore Munic. Elec. Plant....	Georgia Power Co.....	80	*April
Tennville Municipal Electric Distribution System.....	Georgia Power Co.....	80	*Jan.
Toccoa Municipal Distribution System & Wtr. Pwr. Plant....	Georgia Power Co.....	80	*May
Twin City Municipal Distribution System.....	Georgia Power Co.....	80	*June
Woodbury Munic. Ltg. Plant...	Georgia Power Co.....	80	*Dec.
Idaho			
Canyon Light & Water Co.....	Public Utilities Consol. Corp...	76–40	*Aug.
Mullan Light Co.....	Public Utilities Consol. Corp...	76–40	*Aug.
Northwest Light & Water Co...	Public Utilities Consol. Corp...	76–40	*Aug.
Pocatello Gas & Power Co.....	Public Utilities Consol. Corp...	76–40	*Oct.
Potlatch Consol. Electric Co....	L. M. Simpson—F. M. Shields, Spokane, Wash.....	.....	*Sept.
Potlatch Consol. Electric Co....	Potlatch Power Co.....	.....	*Sept.
Potlatch Power Co.....	Washington Water Pwr. Co....	.....	*Oct.
Illinois			
Albion Electric Co.....	Illinois Public Utility Co.....	14	*July
Atlanta Elec. Lt. & Pwr. Co....	Illinois Public Utility Co.....	14	*July
Atwood Electric Lt. & Pwr. Co.	Illinois Public Utility Co.....	14	*July
Aurora, Elgin & Fox River Elec. Co.....	E. H. Rollins & Sons.....	77	*April
Avon Milling Co.....	Illinois Power & Light Corp....	66	*July
Bement Elec. Lt. & Pwr. Co....	Illinois Public Utility Co.....	14	*July
Broadwell Electric Light & Distributing Systems.....	Illinois Power & Light Corp....	66	*Aug.
Champaign County Electric Co..	Illinois Power & Light Corp....	66	*Jan.
Chesterfield Electric Co.....	Central Illinois Pub. Serv. Co..	56	*Mar.
Elizabeth Light & Power Co....	Interstate Light & Power Co...	12–81	*Feb.
Elkhart Electric Light & Distribution Systems.....	Illinois Power & Light Corp....	66	*Aug.
Hardin Elec. Lt. & Pwr. Co....	Central Illinois Pub. Serv. Co..	56	*Oct.
Homer Electric & Power Co....	Illinois Public Utility Co.....	14	*July
Illinois Public Utility Co.....	Central Gas & Electric Co.....	14	*July
Illinois Traction Co. (Venice Power Plant).....	Union Electric Light & Power Co. of Illinois.....	65	*Jan.
Lincoln Water & Light Co.....	Illinois Public Utility Co.....	14	*July
Littleton Electric Light System.	Central Illinois Public Serv. Co.	56	*Feb.
Mt. Pulaski Elec. Lt. & Pwr. Co.	Illinois Public Utility Co.....	14	*July
Perry Light & Power Co.....	Central Illinois Public Serv. Co..	56	*Feb.
Philo Electric Light & Power Co.	Illinois Public Utility Co.....	14	*July
Rock Island County Power Co..	Sherrard Power Co.....	.....	*Oct.
Roscoe Elec. Co. (Stuart Ralston)	Milton Ellis, Rockford.....	.....	*April
Royal Light & Power Co.....	¶Lincoln Water & Light Co.....	14	*Feb.
Seckman, W. F. (Fowler).....	Central Illinois Pub. Serv. Co..	56	*April
Sherman Elec. Lt. & Distr. Sys..	Illinois Power & Light Corp....	66	*Aug.
Shirley Light & Power Co.....	Illinois Power & Light Corp....	66	Oct.
Western United Gas & Electric Co. (w).....	E. H. Rollins & Sons.....	77	*April
Williamsville Electric Light & Distribution System.....	Illinois Power & Light Corp....	66	*Aug.
Catlin Munic. Elec. Lt. Plant...	Gen. Util. Corp. (20-yr. lease)...	.....	*April
Grayville Munic. Elec. Ltg. Plant	Central Illinois Pub. Serv. Co...	56	*June
Rochelle Munic. Ltg. Plant.....	Illinois North. Util. Co., Dixon..	56	*Nov.
Waynesville Munic. Lt. Plant...	Illinois Pub. Util. Co., Lincoln..	14	*Aug.
Indiana			
Albany Water Supply Co.....	Indiana Water Service Co., Indianapolis.....	38	*May
Allen County Elec. Lt. & Pwr. Co.	Indiana & Michigan Elec. Co., South Bend.....	3	*Mar.
Brookville Electric Co.....	Indiana Light & Power Co.....	10–96	*Sept.
Burnettsville Elec. Lt. & Pwr. Co.	Interstate Pub. Serv. Co.....	56	*June
Citizens' Heat, Lt. & Pwr. Co....	United Public Utilities Co.....	89	*April
Clevenger (H. F.) Elec. Property in Bartholomew County.....	H. F. Clevenger Elec. Co., Columbus.....	.....	*Jan.
General Utilities Co.....	Indiana Light & Power Co.....	10–96	*Sept.
Indiana Elec. Corp., Indianapolis St. Ry. Co. trans. lines connecting Lennore sta. of I. E. Co. and substas. of I. S. Ry. Co.....	Middle West Utilities Co.....	56	*April
Indiana Lt. & Pwr. Co. (see also Ohio).....	Atlantic Pub. Util., Inc.....	10–96	*Sept.
Indiana Power & Light Co.....	Indiana Water Service Co., Indianapolis.....	38	*May
Indiana Power & Light Co.....	Indiana & Michigan Elec. Co....	3	*Mar.
Indianapolis Light & Heat Co....	Indianapolis Pwr. & Lt. Co.....	93	*Jan.
Indianapolis Pwr. & Lt. Co.....	Indianapolis Pwr. & Light Corp.	93	*Jan.
Jonesboro Water Co.....	Indiana Water Service Co., Indianapolis.....	38	*May
Merchants Heat & Light Co....	Indianapolis Pwr. & Lt. Co.....	93	*Jan.
Montpelier Utilities Co.....	Indiana Water Service Co., Indianapolis.....	38	*May
People's Utilities Indiana Corp...	Indiana Water Service Co., Indianapolis.....	38	*May
Pine Village Light & Power Co...	Interstate Public Service Co., Indianapolis.....	56	*Jan.
Shepfer Electrical Co.....	Indiana Light & Power Co.....	10–96	*Sept.
Sunman Elec. Lt. & Pwr. Co.....	Dearborn-Ripley Lt. & Pwr. Co.	.....	*May
Thompson Electric Co.....	Interstate Public Service Co., Indianapolis.....	56	*May
Washington Wt., Lt. & Pwr. Co..	Indiana Water Service Co., Indianapolis.....	38	*May
Lawrenceburg Town Serv. Co....	Dearborn-Ripley Lt. & Pwr. Co.	.....	*May
Iowa			
American Utilities Corp. (Oakville).....	People's Gas & Elec. Co., Mason City.....	88	Oct.
Central Iowa Power & Light Co..	Iowa Public Service Co.....	87	*Mar.
Denmark Telephone & Elec. Co..	Walsh Bros., Burlington.....	.....	*Nov.
Dubuque Electric Co.....	Interstate Power Co. (Del.).....	93	†
George Elec. Lt. Plant (Iowa Pub. Serv. Co.).....	Northwestern Lt. & Pwr. Co., Cedar Rapids.....	.....	*Aug.
Harmony Light & Power Co....	Iowa Pub. Serv. Co., Ft. Dodge.	87	*Sept.
Iowa-Nebraska Lt. & Pwr. Co..	Continental Gas & Elec. Corp...	88	*Aug.
Iowa Lt., Ht. & Pwr. Co.....	¶Central Iowa Pwr. & Lt. Co...	87	*Mar.
Iowa Light, Heat & Power Co..	Iowa Public Service Co.....	87	*May
Iowa Service Co.....	Iowa-Nebraska Lt. & Pwr. Co..	88	*Aug.
People's Iowa Water Wks. Co. (t)	G. L. Ohrstrom & Co.....	68	*April
Salamonia Lt. & Pwr. Co.....	Union City Electric Co.....	31–60	*Oct.
Tri-State Utilities Co.....	Interstate Power Co. (Del.)....	93	†
Augusta Munic. Elec. & Tel. Plant	People's Gas & Elec. Co., Mason City.....	88	*Oct.
Brunsville Munic. Elec. Plant...	¶Iowa Lt., Heat & Power Co..	87	*April
Denmark Munic. Elec. & Tel. Plant.....	People's Gas & Elec. Co., Mason City.....	88	*Oct.
Earlham Munic. Plant.....	¶Iowa Lt., Heat & Power Co..	87	*April
Early Munic. Elec. & Distr. Sys..	Iowa Public Service Co.....	87	*Aug.
Laurens Munic. Lt. & Pwr. Plant	Central States Elec. Co., Cedar Rapids.....	.....	*Jan.
Luverne Munic. Elec. System...	Iowa Public Service Co.....	87	*Sept
Oto Municipal Distr. System....	¶Iowa Light, Heat & Power Co.	87	*Mar.
Ottosen Munic. System.....	¶Central Iowa Pwr. & Lt. Co.	87	*Jan.
Vincent Munic. Elec. Distr. Sys..	¶Central Iowa Pwr. & Lt. Co.	87	*Jan.
Kansas			
Alma Light & Power Co.....	Central States Edison Co., Chicago, Ill.....	15	*Sept.
Chanute Ice & Light Co. (b)....	American Commonwealths Pwr. Corp.....	6	Feb.
Inland Pwr. & Lt. Corp. (Kansas properties).....	Kansas Power Co. (j).....	21–46	*Oct.
Kansas City Power & Light Co.	Continental Gas & Elec. Corp...	88	*Aug.
Kansas City Public Service Co. (Missouri River Power House)	Kansas City Power & Light Co.	88	*June
Kansas Power Co. (j).....	Insull Son & Co., Inc.....	46	*June
Kansas Power & Light Corp. (Goodland only).....	Public Utilities Kansas Corp...	76–40	*Oct.
Kansas Public Service Co. (Plant at Second St. & Grand Ave.).	Kansas Pwr. & Lt. Co., Topeka.	66	*May
Kansas Utilities Co. (b).....	American Commonwealths Pwr. Corp.....	6	*June
Public Utilities Kansas Corp....	Public Util. Consol. Corp.....	76–40	*June
Rossville Elec. Lt., Ice & Elev. Co.	Kansas Pwr. & Lt. Co., Topeka.	66	*April
Rural Light & Power Co.....	Kansas City Power & Light Co.	88	*Mar.
Topeka Edison Co.....	Kansas Pwr. & Lt. Co., Topeka.	66	*Apr.
Topeka Railway Co.....	Kansas Pwr. & Lt. Co., Topeka.	66	*April
Tri-County Light & Power Co...	Western Lt. & Pwr. Co., Salina..	.....	Oct.
Union Power Co.....	Kansas Pwr. & Lt. Co., Topeka.	66	*April
Bern Municipal Ltg. System....	United Pwr. & Lt. Corp., Abilene	66	*April
Cedar Vale Munic. Generating Station & Distribution System	Inland Util. Co., Kansas C., Mo.	.....	*Feb.
Delphos Municipal Light Plant..	United Pwr. & Lt. Corp., Abilene	66	*Oct.
Fairview Municipal Plant & Distribution System.....	Kansas Pwr. & Lt. Co., Topeka	66	*Mar.
Kiowa Elec. Lt. & Pwr. Plant....	Western Light & Power Co....	....	*Dec.
Moran Munic. Plant & Distr. Sys.	J. E. Houdashelt.....	.....	*Feb.
Ness City Municipal Light & Power Plant.....	Western Lt. & Pwr. Co., Salina.	.....	*Feb.
Nickerson Munic. Lt. Plant....	United Power & Light Corp....	66	*Nov.
Plains Munic. Electric Plant....	United Power & Light Corp....	66	*Mar.
Wetmore Munic. Pwr. & Lt. Plant	United Power & Light Corp....	66	*Apr.
Kentucky			
Caneyville Light Co.....	Kentucky Utilities Co.....	56	*Sept.
Cumberland Light Co.....	Kentucky Utilities Co.....	56	*June
Interstate Utilities Co.....	Kentucky Utilities Co.....	56	*Jan.
Maysville & Flemingsburg Light & Power Co. (n).....	Kentucky Power Co., Augusta.	.....	*April
Maysville Gas & Elec. Co. (n)..	Kentucky Power Co., Augusta.	.....	*April
Benton Munic. Lt. & Pwr. Plant	Federal Public Utilities Co.....	37	*Oct.
Russellville Municipal Light & Power Plant.....	Kentucky-Tennessee Lt. & Pwr. Co.....	9–95	*Sept.
Louisiana			
Gulf States Utilities Co.....	Southwestern Gas & Elec. Co..	56	*April
Louisiana Ice & Utilities Co....	Commonwealth Utilities Corp..	23–85	April
Mansfield Light & Power Co....	American Utilities Co.....	7–41	*Aug.
Sulphur Light & Power Co.....	Gulf States Utilities Co.....	35–82	*Oct.
Church Point Municipal Plant..	Federal Pub. Util. Co., Chicago	37	*Nov.
Crowley Munic. Elec. Plant....	Gulf Pub. Serv. Co.....	24–87	*May
Lecompte Munic. Elec. Plant....	Louisiana Ice & Utilities, Inc....	23–85	*Jan.
Marksville Municipal Electric Light & Water Works.....	Federal Pub. Util. Co., Chicago.	37	*Nov.
Washington Municipal System..	Gulf Public Service Co., Jacksonville, Tex.....	24–87	*Mar.
Winnsboro Municipal Light & Power Plant.....	Louisiana Power & Light Co...	32–30	*April
Maryland			
Annapolis & Chesapeake Bay Power Co.....	Consolidated Gas Elec. Lt. & Pwr. Co. of Baltimore through Baltimore Corp. of Maryland.	.....	*June
Baltimore Electric Co.....	Consolidated Gas Elec. Lt. & Pwr. Co. of Baltimore.....	.....	*June
Citizens' Lt., Ht. & Pwr. Co....	Associated Maryland Elec. Pwr. Corp.....	.....	*Nov.
Clear Spring Elec. Lt. & Pwr. Co.	Potomac Edison Co., Hagerstown	8	*Sept.
Consumers Ice. Co. (e, f).....	Day & Zimmermann, Inc.....	24–87	*Mar.
Deal Island Electric Co.....	Maryland East Coast Utilities	27	*Nov.
Delmarvia Utilities Co. (o, e, f).	Day & Zimmermann, Inc.....	24–87	*Mar.
Electric & Ice Manufacturing Co.	Maryland East Coast Util. Co..	27	*Nov.
Elkton Electric Co.....	Northern Maryland Pwr. Co....	29	*April
Exmore Lt. & Pwr. Co. (e, f)...	Day & Zimmermann, Inc.....	24–87	*Mar.
Havre de Grace Electric Co....	Northern Maryland Pwr. Co....	29	*April
Home Mfg. Lt. & Pwr. Co.....	Northern Maryland Pwr. Co....	29	*April
Kent County Elec. Co. (o, e, f)...	Day & Zimmermann, Inc.....	24–87	*Mar.
North Baltimore Service Co. (g).	Electric Public Utilities Co....	33	Mar.



New England has been the scene of many mergers and interconnectious during 1927

Company Involved	Acquiring Company	Holding Company	Date of Merger
Northern Maryland Electric Co.	Northern Maryland Power Co.	29	*April
Washington, Baltimore & Annapolis Elec. Railroad Co.	Consolidated Gas, Elec. Lt. & Pwr. Co. of Baltimore, through Baltimore Corp. of Maryland.	.....	*June
Snow Hill Municipal Electric Light & Power Co.	Eastern Shore Gas & Electric Co. (*o*, *e*)	62–42 24–87	*July

Massachusetts

Adams Gas Light Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Agawam Electric Co.	Western Massachusetts Cos.	.....	*Jan.
Amesbury Electric Light Co.	Massachusetts Util. Inv. Trust.	71–55	*May
Amherst Gas Co.	Western Massachusetts Cos.	.....	*Jan.
Arlington Gas Light Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Athol Gas & Elec. Co. (*d*)	Massachusetts Util. Inv. Trust.	71–55	May
Ayer Electric Light Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Blackstone Elec. Light Co. (*c*)	Massachusetts Util. Inv. Trust.	71–55	May
Cambridge Electric Light Co.	New England Gas & Elec. Assn.	9–95	*May
Cambridge Gas Light Co.	New England Gas & Elec. Assn.	9–95	*May
Cape & Vineyard Electric Co.	New England Gas & Elec. Assn.	9–95	*July
Central Massachusetts Electric Co. (*c*)	Massachusetts Util. Inv. Trust.	71–55	*May
Central Massachusetts Power Co	Massachusetts Util. Inv. Trust.	71–55	*May
Clinton Gas Light Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Easthampton Gas Co.	Western Massachusetts Cos.	94	*Jan.
Edison Elec. Illg. Co. of Boston §	Massachusetts Util. Inv. Trust.	71–55	†
Franklin County Power Co.	Massachusetts Util. Inv. Trust.	71–55	*May
Gardner Gas, Fuel & Light Co.	Massachusetts Util. Inv. Trust.	71–55	May
Gloucester Gas Light Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Greenfield Elec. Lt. & Pwr Co.	Western Massachusetts Cos.	94	*Jan.
Harvard Gas & Elec. Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Lee Electric Co.	Western Massachusetts Cos.	94	*Sept.
Leominster Electric Light & Power Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Leominster Gas Light Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Lexington Gas Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Marlborough Electric Co.	Massachusetts Util. Inv. Trust.	71–55	May
Marlboro-Hudson Gas Co. (*d*)	Massachusetts Util. Inv. Trust.	71–55	May
Merrimac V'l'y Pwr. & Bldg. Co.	Massachusetts Util. Inv. Trust.	71–55	*May
Milford Electric Light & Power Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Milford Gas Light Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Mill River Electric Lt. Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
North Adams Gas Lt. Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Northampton Elec. Ltg. Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Northampton Gas Lt. Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Norton Power & Elec. Co. (*c*)	Massachusetts Util. Inv. Trust.	71–55	May
Norwood Gas Co.	Massachusetts Util. Inv. Trust.	71–55	May
Palmer Gas Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Plymouth Electric Lt. Co. (*r*)	Massachusetts Util. Inv. Trust.	71–55	*May
Plymouth Gas Light Co.	Massachusetts Util. Inv. Trust.	71–55	May
Randolph & Holbrook Power & Electric Co.	Massachusetts Util. Inv. Trust.	71–55	*May
Southeastern Massachusetts Power & Electric Co.	Massachusetts Util. Inv. Trust.	71–55	*May
So. Berkshire Pwr. & Elec. Co.	Massachusetts Util. Inv. Trust.	71–55	*May
Spencer Gas Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Turners Falls Pwr. & Elec. Co.	Western Massachusetts Cos.	94	*Jan.
Union Light & Power Co. (*c*)	Massachusetts Util. Inv. Trust.	71–55	May
Ware Electric Co. (*c*)	Massachusetts Util. Inv. Trust.	71–55	May
Webster & Southbridge Gas & Electric Co.	New England Power Assn.	64	*July
Westborough Gas & Electric Co.	Massachusetts Util. Inv. Trust.	71–55	May
Weymouth Light & Power Co.	Massachusetts Util. Inv. Trust.	71–55	May
Waymouth Water Power Co.	Massachusetts Util. Inv. Trust.	71–55	May
Williamstown Gas Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Winchendon Elec. Lt. & Pwr. Co.	Massachusetts Util. Inv. Trust.	71–55	May
Woburn Gas Light Co. (*h*, *m*)	Massachusetts Util. Inv. Trust.	71–55	May
Worcester Gas Light Co.	New England Gas & Elec. Assn.	9–95	*May
Worcester Suburban Elec. Co.	Massachusetts Util. Inv. Trust.	71–55	*May

Michigan

Alpha Lighting Co.	Wisconsin Michigan Power Co.	65	*July
Amasa Lighting Co.	Wisconsin Michigan Power Co.	65	*July
Boyne City Electric Co.	Michigan Public Service Co. (*j*)	21–46	*June
Boyne Falls Light & Power Co.	Michigan Public Service Co. (*j*)	21–46	*June
Boyne River Power Co.	Michigan Public Service Co. (*j*)	21–46	*June
Dickinson County Pub. Serv. Co.	Wisconsin Michigan Power Co.	65	*July
Elk Electric Co.	Michigan Public Service Co. (*j*)	21–46	*June
Grayling Electric Co.	Michigan Public Service Co. (*j*)	21–46	*July
Iron Mountain Electric Light & Power Co.	Wisconsin Michigan Power Co.	65	*July
Loretto Light & Power Co.	Wisconsin Michigan Pwr. Co.	65	*July
Michigan Public Service Co. (*j*)	Insull Son & Co., Inc.	21–46	*June
Michigan United Lt. & Pwr. Co.	Michigan Public Service Co. (*j*)	21–46	*June
Michigan Water Power Co.	Central Public Utility Corp.	14	Mar.
Peninsular Power Co.	Wisconsin Michigan Power Co.	65	*July
Powers-Spaulding Light Co.	Wisconsin Michigan Power Co.	65	*July
Southern Michigan Paver Co. (Quincy plant)	Consumers Pwr. Co., Jackson	22–45	Sept.
Twin Falls Light Co.	Wisconsin Michigan Power Co.	65	*July
Walloon Lake Pwr. & Lt. Co.	Michigan Public Service Co. (*j*)	21–46	*June
Wisconsin Michigan Power Co.	The North American Co.	65	*July
Shepherd Municipal Electric Light & Power System.	Consumers Pwr. Co., Jackson	22–45	*June

Minnesota

Atwater Light & Power Co.	Northern States Power Co.	13–81	*May
Bemidji Elec. & Mfg. Co.	Interstate Power Co. (Del.)	93	†
Edgerton Elec. Distr. Plant.	Northern States Power Co.	13–81	*Oct.
Farmington Elec. Lt. & Pwr. Co.	Drake-Jones Inv. Co., Minn.	25	*May
Lake Shore Electric Co.	Successor not known.	.....	Oct.
Littlefork Light & Power Co.	City of Littlefork	.....	*Sept.
Milan Light & Power Co.	Western Pwr. & Lt. Co., Waconia	.....	*Jan.
Minnesota Elec. Distr. Co.	Interstate Power Co. (Del.)	93	*Mar.
Minnesota Power Co.	Northern States Power Co.	13–81	*Mar.
New Richland Lt. & Pwr. Co.	Northern States Power Co.	13–81	*Sept.
People's Light & Power Co.	Interstate Power Co. (Del.)	93	†
People's Minnesota Gas & Elec. Corp. (*t*)	G. L. Ohrstrom & Co.	68	*April
Red River Valley Power Co.	Interstate Power Co. (Del.)	93	†
Bellingham Municipal Plant.	Western Pwr. & Lt. Co., Waconia	.....	*Jan.
Champlin Munic. Elec. Ltg. Sys.	Minneapolis Gen. Elec. Co.	13–81	*June
Louisburg Munic. Electric Distr. System.	Western Power & Light Co.	.....	*June
Spring Grove Munic. System.	Root River Pwr. & Light Co., Preston.	.....	Oct.
Wood Lake Munic. Elec. Distr. System.	Northern States Power Co.	13–81	*Oct.

Mississippi

Leakesville Lt. & Ice Plant.	Federal Public Utilities Co.	37	*Aug.
Waynesboro Ice & Light Co.	Federal Public Utilities Co.	37	*Aug.
Carrollton Munic. Lt. & Power Plant.	Mississippi Pwr. & Lt. Co.	32–30	*Jan.
Corinth Munic. Wtr., Lt. & Pwr. Utility.	Mississippi Power Co.	80	*Oct.
Isola Munic. Light Plant.	Mississippi Power & Light Co.	32–30	*Jan.
Lucedale Munic. Lt. & Pwr. Co.	Federal Pub. Util. Co., Chicago	37	*Nov.
Port Gibson Munic. Light & Wtr. Plant.	Mississippi Pub. Service Co.	.....	*July
Tupelo Munic. Elec. Lt. Plant.	Mississippi Pwr. & Light Co.	32–30	Feb.

Missouri

Arkansas-Missouri Pwr. Co. (*j*)	Insull Son & Co., Inc.	21–46	*June
Browning-Purdin Elec. Co.	Consumers Pub. Service Co., Brookfield.	.....	Oct.
East Missouri Power Co.	Inland Pwr. & Light Corp.	21–46	*June
Galena Electric Plant.	Electric Utilities Co., Joplin.	19	*Mar.
Gilliam Elec. Lt. & Pwr. Co.	Kansas Power & Light Co.	66	†
Kansas City Pwr. & Light Co.	Continental Gas & Elec. Corp.	88	*Aug.
Kansas City Pub. Serv. Co.	Kansas City Pwr. & Light Co.	88	*June
King City Elec. & Mfg. Co.	Maryville Elec. Lt. & Pwr. Co.	88	*Oct.
Laclede Electric Light Co.	Consumers' Public Service Co., Brookfield.	.....	Oct.
Laclede Gas Light Co (*k*)	Laclede Gas & Electric Co.	93	*May
Laclede Pwr. & Lt. Co. (*k*)	Utilities Pwr. & Light Corp.	93	*May
Maryville Elec. Lt. & Pwr. Co.	Iowa-Nebr. Lt. & Pwr. Co.	88	*Aug.
Missouri Public Service Co. (*j*)	Insull Son & Co., Inc.	46	*June
Missouri Utilities Co. (*b*)	American Commonwealths Pwr. Corp.	6	*June
New Hampton Electric Co.	Missouri Public Service Co. (*j*)	46	*Nov.
Powersville Light Plant.	Missouri Power & Light Co.	66	*Aug.
Rothville-Sumner Electric Co.	Consumers' Public Service Co., Brookfield.	.....	Oct.
Springfield Traction Co.	Springfield Gas & Elec. Co.	36	*May
Stover Light Co.	Missouri Utilities Co.	6	Oct.
Windsor Light & Power Co.	Missouri Public Service Co. (*j*)	46	Oct.
Ridgeway Municipal Power Co.	Missouri Public Service Co. (*j*)	46	*Aug.

Montana

Flathead Valley Electric Co.	Pub. Util. Consolidated Corp.	76–40	*Aug.
Helena Light & Railway Co. (Electric properties only)	Helena Gas & Electric Co.	95	Nov.
Mission Range Power Co.	Pub. Util. Consolidated Corp.	76–40	*Aug.
Miles City Munic. Ltg. Plant.	Montana-Dakota Power Co.	57	*May

Nebraska

Beatrice Power Co.	Central States Elec. Co. of Nebr.	.....	*April
Central West Public Serv. Co. (properties formerly operated by Platte Valley Power Co.)	Nebraska Power Co.	5–30	*Sept.
Consumers Electric Serv. Co.	Northwestern Public Serv. Co.	31–60	†
Eagle Light Plant.	Nebraska Power Co.	5–30	*April
Erickson Hydro-Electric Plant.	Nebr. Elec. Pwr. Co., Omaha	35–82	*June
Interstate Power Co. (Del.): (Nebraska properties)	Interstate Pwr. Co. of Nebr.	93	*Mar.
Iowa-Nebraska Lt. & Pwr. Co.	Continental Gas & Elec. Corp.	88	*Aug.
Krug Light & Power Co.	Central States Edison Co., Chic.	15	*April
Lincoln Public Service Co.	Iowa-Nebr. Light & Pwr. Co.	88	*Aug.
Lincoln Traction Co.	Iowa-Nebr. Light & Pwr. Co.	88	*Aug.
Minnesota Elec. Distr. Co.: (Northeastern Nebraska properties)	Interstate Pwr. Co. of Nebr.	93	*Mar.
Nebraska City Wtr. & Lt. Co.	Central Pwr. Co., Grand Island	56	*June
Nebraska Electric Power Co.	Eastern Texas Electric Co.	35–82	*Jan.
Nebraska Gas & Electric Co.	Iowa-Nebr. Lt. & Pwer Co.	88	*Aug.
Nebraska Light & Power Co.	United Gas Improvement Co.	87	*Aug.
Omaha & Lincoln Ry. & Lt. Co.: Electric light properties, including power development on Platte River at Ashland.	Nebraska Power Co.	5–30	*Mar.
Platte Center Light & Pwr. Co.	Northwestern Public Serv. Co.	31–60	*June
¶Platte Valley Power Co.	Dakota Public Service Co.	51–54	*Feb.
Rogge, J. H. (Elmwood)	Nebraska Power Co.	5–30	*April
Steinauer Distr. Sys. & Trans. Line to Pawnee City.	Iowa-Nebr. Light & Pwr Co.	88	*Nov.
Tri-States Utilities Co. (Nebraska properties)	Interstate Pwr. Co. of Nebraska	93	*Mar.
Western Pub. Serv. Co. (Gering only)	City of Gering.	.....	*Sept.
Winnebago Light & Pwr. Co.	Central States Electric Co. of Nebraska, Omaha.	.....	*Mar.
Alvo Munic. Lighting System.	Nebraska Power Co.	5–30	*April
Arapahoe Munic. Lt. & Wtr. Pl.	Nebraska Electric Power Co.	35–82	*April
Big Springs Munic. Distr. Sys.	Western Public Service Co.	35–82	*Oct.
Bruning Munic. Distr. System.	Nebraska Power Co.	5–30	Oct.
Burchard Munic. Plant & Lines.	Iowa-Nebr. Lt. & Pwr. Co.	88	*Nov.
Colon Municipal System.	Nebraska Power Co.	5–30	Oct.
Dorchester Municipal Plant.	¶Nebr. Gas & Electric Co.	88	*Aug.
Eagle Municipal Plant.	Nebraska Power Co.	5–30	*April
Edison Municipal System.	Nebraska Electric Power Co.	35–82	*April
Homer Munic. Elec. Lt. Plant.	Central States Elec. Co. of Nebraska.	.....	*Mar.
Millard Municipal Plant.	Nebraska Power Co.	5–30	*July
Monroe Munic. Lt. & Pwr. Plant & Distribution System.	Northwestern Public Serv. Co.	31–60	*April
Murdock Municipal Plant.	Nebraska Power Co.	5–30	*April
North Loup Munic. Plant & Sys.	Nebraska Power Co.	5–30	*Feb.

Company Involved	Acquiring Company	Holding Company	Date of Merger
Orleans Munic. Distr. Sys. & Transmission Line to Alma	Western Public Service Co.	35-82	*Feb.
Pilger Munic. Distr. System	Iowa-Nebr. Lt. & Power Co.	88	*Oct.
Pleasant Dale Munic. Plant	¶Nebraska Gas & Electric Co.	88	*Aug.
Richland Munic. Electric Plant	Northwestern Pub. Serv. Co.	31-60	*July
Seward Munic. Elec. Ltg. Plant	Town of Madison		*April
Sterling Munic. Elec. Plant	¶Nebraska Gas & Electric Co.	88	*Dec.
Walthill Munic. Elec. Lt. Plant	Central States Elec. Co. of Nebr.		*Mar.
Weeping Water Munic. Ltg. Pl.	Nebraska Power Co.	5-30	*June

New Hampshire

Allen & Co., William F.	Southern New Hampshire Hydro-Electric Co., Colebrook	56	*Jan.
Portsmouth Power Co.	New England Gas & Elec. Assn.	9-95	*July
Rust, Henry B. (Warren)	Baker River Lt. & Power Co., Warren		*Jan.
Salmon Falls Mfg. Co.	New England Pub. Serv. Co.	56	*July

New Jersey

Atlantic County Electric Co.	Atlantic City Electric Co.	3	Aug.
East Brunswick Mutual Light & Power Co.	Pub. Serv. Elec. & Gas Co.	75	May
Electric Co. of New Jersey	Atlantic City Electric Co.	3	Aug.
Essex & Hudson County Gas Co	Publ c Service Elec. & Gas Co.	75	*May
Gas & Elec. Co. of Bergen Cty.	Public Service Elec. & Gas Co.	75	*May
Hudson County Gas Co.	Public Service Elec. & Gas Co.	75	*May
Jersey Central Pwr. & Lt. Co.(e)	Day & Zimmermann, Inc.	24-87	*Mar.
New Brunswick Light, Heat & Power Co.	Public Service Elec. & Gas Co.	75	*May
Newark Consolidated Gas Co.	Public Service Elec. & Gas Co.	75	*May
Paterson & Passaic Gas & Elec-Co.	Public Service Elec. & Gas Co.	75	*May
Sayreville Elec. Lt. & Pwr. Co.	Eastern New Jersey Pwr. Co.	93	*April
Somerset, Union & Middlesex Lighting Co.	Public Service Elec. & Gas Co.	75	*May
Pompton Lakes Munic. Hydro-Electric Plant	Jersey Central Pwr. & Lt. Co.	62-42	*Jan.
Sea Side Park Munic. Elec. Plant	Jersey Central Pwr. & Lt. Co.	24-87	Jan.

New Mexico

Belen Water & Light Co.	New Mexico Pwr. Co., Santa Fe	36	Mar.
New Mexico Utilities Co. (b)	American Comwlths. Pwr. Corp.	6	*June

New York

Adirondack Electric Pwr. Corp.	New York Pwr. & Light Corp.	58	*Oct.
Adirondack Pwr. & Light Corp.	New York Pwr. & Light Corp.	58	*Oct.
American Woolen Mills (Power & Water rights)	Oswego Falls Corp., Fulton		*Jan.
Barber, Fenton W. (Lewis)	Plattsburg Gas & Electric Co.	9-95	*Nov.
Bergen Rural Electric Co.	Niagara, Lockport & Ontario Power Co.	12	*Mar.
Blooming Grove Elec. Distr. Sys.	Orange & Rockland Elec. Co.		*Feb.
Cohoes Power & Light Corp.	New York Pwr. & Light Corp.	58	*Oct.
Consolidated Electric Co.	¶Adirondack Pwr. & Lt. Corp.	58	*April
Eastern New York Util. Corp.	New York Pwr. & Light Corp.	58	*Oct.
Fort Covington Light, Heat & Power Co. (p, q)	St. Regis Paper Co.	67-78	*June
Fulton County Gas & Elec. Co.	New York Pwr. & Light Corp.	58	*Oct.
Fulton Light, Heat & Pwr. Co.	Eastern Gas & Elec. Securities Corp. (Conn.)	28	*Feb.
Georgetown Elec. Ltg. Co., Inc.	New York State Gas & Electric Corp.	9-95	*June
Grand Island Lt. & Pwr. Corp.	Tonawanda Power Co.	12	Jan.
La Salle Electric Corp.	Niagara Electric Service Corp.	12	*Sept.
Lamoka Power Corp.	Lake Ontario Power Corp.		*July
Ledyard Lighting Co.	Empire Gas & Elec. Co., Geneva	34-74	*April
Lewiston Power Corp.	Niagara Electric Service Corp.	12	*Sept.
Long Beach Power Co.	Queens Borough Gas & Elec. Co.	53	*July
Long Island Lighting Co.§	American Comwlths Pwr. Corp.	6	*Jan.
M. B. Light & Power Co., Inc.	New York State Gas & Electric Corp.	9-95	*Sept.
Malone Light & Pwr. Co. (p, q)	St. Regis Paper Co.	67-78	*June
Marion Power Corp.	Lake Ontario Power Corp.		*July
Mexico Electric Co.	Seneca River Pwr. Co., Baldwinsville	58	*Jan.
Milo Paper Mills (incl. water power on Kenka Lake)	Empire Power Co.	34-74	*Oct.
Milling & Ltg. Co., Inc., of Brasher Falls (p, q)	St. Regis Paper Co.	67-78	*June
Munic. Gas Co. of the City of Albany	New York Pwr. & Light Corp.	58	*Oct.
New York Pwr. & Light Corp.	Mohawk Hudson Power Corp.	58	*Aug.
Niagara, Lockport & Ontario Power Co. (Orangeville & Wethersville)	¶Western New York Util., Inc.	12	*Oct.
Northern Cayuga Lt. & Pwr. Corp.	Lake Ontario Power Corp.		*July
Northern New York Util., Inc. (p, q)	St. Regis Paper Co.	67-78	*June
Northern Wayne Elec. Lt. & Pwr. Co.	Rochester Gas & Elec. Corp.	59	*Sept.
Oakland Power Co., Inc.	Rockland Lt. & Pwr. Co., Nyack	83	*May
Oswego River Power Corp. (p)	St. Regis Paper Co.	67-78	*June
People's Gas & Elec. Co. (p)	St. Regis Paper Co.	67-78	*June
Phelps, Harley R. (Vienna)	Niagara Lockport & Ontario Power Co.	12	*Oct.
Preston Power Corp.	Lake Ontario Power Corp.		*July
Raquette River Pwr. Co. (p)	St. Regis Paper Co.	67-78	*June
Sanborn-Pekin Power Co., Inc.	Niagara, Lockport & Ontario Power Co.	12	*Mar.
Seneca River Power Co.	Syracuse Lighting Co.	58	*July
Sodus Gas & Elec. Light Co.	Lake Ontario Power Corp.		*July
Souve, Emory (Vienna only)	Niagara, Lockport & Ontario Power Co.	12	*May
Staten Island Edison Corp.	New York State Gas & Elec. Corp.	9-95	*Mar.
Tracy Development Co.	Empire Power Corp.	34-74	*June
Troy Gas Co.	New York Power & Lt. Corp.	58	*Oct.
Tusten Light & Power Co.	New York State Gas & Electric Corp.	9-95	*April
Union Springs Lt. & Pwr. Co.	Empire Gas & Elec. Co., Geneva	34-74	*April
Western New York Util., Inc.	Buffalo, Niagara & Eastern Pwr. Corp.	12	*Mar.
Western New York Util., Inc.	Niagara, Lockport & Ontario Power Co.	12	*Nov.
Windham Valley Electric Co.	New York State Gas & Electric Corp.	9-95	*Sept.
Wynantskill Hydro-Elec. Co.	Harlem Val. Elec. Corp., Pawling	9-95	*April
Long Beach Munic. Elec. Plant & Distribution System	Long Beach Power Co.		*Nov.

North Carolina

Blue Ridge Power Co.	Southern Power Co.	26	*June
Moravian Power Co.	Southern Public Utilities Co.	26	†
North Carolina Pub. Serv. Co.	Southern Power Co.	26	*June
Tide Water Power Co. (e)	Day & Zimmermann, Inc.	24-87	*Mar.
Troutman Light & Power Co.	Southern Public Utilties Co.	26	*Oct.
Ahoskie Municipal Distr. Sys.	Virginia Electric & Pwr. Co.	35-82	*May
Coleraine Munic. Distr. Sys.	Virginia Electric & Pwr. Co.	35-82	*May
Conover Munic. Elec. Lt. Plant	Southern Pub. Utilities Co.	26	*Oct.
Edenton Municipal System	Virginia Electric & Pwr. Co.	35-82	*Mar.
Elkin Municipal Plant	Southern Pub. Utilities Co.	26	*Feb.
Harrelsville Munic. Distr. Sys.	Virginia Electric & Pwr. Co.	35-82	*May
Kernersville Municipal Plant	Southern Pub. Utilities Co.	26	*Feb.
Madison Municipal Plant	Southern Pub. Utilities Co.	26	*Jan.
Marshville Municipal Plant	Southern Pub. Utilities Co.	26	*Feb.
Mount Airy Municipal Plant	Southern Pub. Utilities Co.	26	*Feb.
New London Munic. Elec. Light Plant	Southern Pub. Utilities Co.	26	*June
North Wilkesboro Munic. Elec. Distribution System	Southern Pub. Utilities Co.	26	*Feb.
Powellsville Munic. Distr. Sys.	Virginia Electric & Pwr. Co.	35-82	*May
Spray Munic. Distr. System	Leaksville Lt. & Power Co.		Oct.
Stoneville Municipal Plant	Southern Pub. Utilties Co.	26	*Feb.
Tarboro Munic. Elec. Lt. Plant	Virginia Electric & Pwr. Co.	35-82	*Jan.
Wingate Municipal Plant	Southern Public Utilities Co.	26	*Feb.
Winton Munic. Distr. System	Virginia Electric & Pwr. Co.	35-82	*May

North Dakota

Bisbee Elec. Lt. & Power Co.	Otter Tail Power Co., Fergus Falls, Minn.	69	*Jan.
Bucyrus Electric Plant	Hettinger Elec. Lt. & Pwr. Co.		*Nov.
Carson Elec. Co. (Duncan Noyes)	Hughes Electric Co.		*May
Churches Ferry Elec. Lt. Plant	Otter Tail Power Co.	69	Sept.
Drake-Jones Inv. Co. (Rolla & Cando)	¶Pub. Serv. Corp. of N. Dakota	69	Sept.
Edinburg Motor Co.	Otter Tail Power Co.	69	*Sept.
Egeland Lt., Heat & Pwr. Co.	Otter Tail Power Co.	69	*Jan.
Ellendale Electric Co.	United Public Utilities Co.	89	*April
Forman Elec. Lt. & Pwr. Plant	Otter Tail Power Co.	69	*June
Foss & Astrup (Grenora)	Montana-Dakota Power Co.	57	*Aug.
Hanks Hrdwe. Co. (Elec. Dept.)	Montana-Dakota Pwr. Co.	57	*Aug.
Hughes & Deiters Elec. Co.	Hughes Electric Co.		July
International Pub. Serv. Corp.	Interstate Pwr.Co. of N. Dakota	93	*July
Kelly Electric Co.	George Crook		*June
Lakota Lt. & Pwr. Plant	Pub. Serv. Corp. of Lakota		*Mar.
Lean, A. H. (Rock Lake)	Otter Tail Power Co.	69	*Jan.
Leeds Electric Lt. & Pwr. Co.	Otter Tail Power Co.	69	Sept.
Napoleon Light & Power Co.	Northern Power & Light Co., Mobridge, S. D.		*Jan.
New Leipzig Electric Co.	Hughes Electric Co.		*Sept.
Northern Power & Light Co.	United Public Utilities Co.	89	*April
Otter Tail Power Co. (Grafton)	City Council		*Sept.
Otter Tail Pwr. Co. (Harvey pl.)	Central Lt. & Pwr. Co. of North Dakota	16	Feb.
Public Service Corp. of North Dakota (Rolla plant)	Otter Tail Power Co.	69	*Sept
¶Rolla Mill & Power Plant	Drake-Jones Co., Minneapolis, Minn.	25	*May
Rollette Light & Power Co.	Otter Tail Power Co.	69	*June
Rugby Light & Power Co.	Otter Tail Power Co.	69	*June
Sherwood Electric Co.	Montana-Dakota Power Co.	57	Oct.
Stewart Milling Co., S. (Mott)	Hughes Electric Co.		*Sept.
Woodward, F. M. (Botineau)	Otter Tail Power Co.	69	*Jan.
York Electric System	Otter Tail Power Co.	69	*June
Zerrull, I. W. (Orr)	Otter Tail Power Co.	69	*April
Cando Utilities (Municipal)	Drake-Jones Inv. Co., Minneapolis, Minn.	25	*May
Cleveland Municipal Plant	Northern Util. Corp., Jamestown	51-54	*Nov.
Dunseith Municipal Plant	Otter Tail Power Co.	69	*Mar.
Marmarth Munic. Light Plant	¶W. H. Thomas, Bowman		*May
Marmarth Munic. Light, Heat, Water & Power Plant	Montana-Dakota Power Co.	57	June
	Northern Power & Light Co., Mobridge, S. D.		*July
Milton Municipal Plant	Otter Tail Power Co.	69	*June
Munich Municipal Plant	Otter Tail Power Co.	69	*June
Pisek Munic. Plant (formerly Dvorack Bros.)	Otter Tail Power Co.	69	Sept.
St. Thomas Municipal Plant	Otter Tail Power Co.	69	*Sept.

Ohio

Brookville-Lewisburg Ltg. Co.	United Public Utilities Co.	89	*April
Buckeye Light & Power Co.	United Public Utilities Co.	89	*April
Cincinnati Suburban Power Co.	Union Gas & Electric Co.	20	*June
Columbus Ry., Power & Lt. Co.	Continental Gas & Elec. Corp.	88	*Aug.
Dayton, Covington & Piqua Traction Co.	United Public Utilities Co.	89	*April
Farmington Light & Pwr. Co.	Ohio Public Service Co.	19	June
Greenville Elec. Lt. & Pwr. Co.	United Public Utilities Co.	89	*April
Indiana Lt. & Pwr. Co.: Allen, Defiance, Hancock, Henry Putnam & Wood Counties; (see also Indiana)	Atlantic Pub. Utilities, Inc.	10-96	*Sept.
Lake Shore Electric Ry. Co.	F. W. Coen, Cleveland & Assoa.		Mar.
London Light & Power Co.	Ohio Edison Co.	22-45	*May
Lytle Light & Power Co.	Northern Power & Light Co., Mobridge, S. D.		*Sept.
North Fairfield Lt. & Pwr. Co.	Lake Shore Elec. Ry. Co., through Lake Erie Pwr. & Lt. Co., Sandusky		Oct.

Company Involved	Acquiring Company	Holding Company	Date of Merger
Ohio Pub. Serv. Co. (Gas holdings)	Columbia Gas & Elec. Co. of New York	.....	*Oct.
Ohio River Edison Co. (z)	Penn-Ohio Securities Corp.	72	*Mar.
Ohio River Trans. Co. (z)	Penn-Ohio Securities Corp.	72	*Mar.
Penn-Ohio Electric Co. (z)	Penn-Ohio Securities Corp.	72	*Mar.
Stark Elec. R.R. (Elec. business)	Alliance Electric Co.	.....	*Aug.
Wooster Electric Co.	Electric Public Utilities Co.	33	*July
Oklahoma			
Chicasha Gas & Elec. Co.	Southwestern Light & Pwr. Co.	56	*Mar.
Choctaw Lumber Co. (Dierks Lumber & Coal Co.)	Public Service Co. of Oklahoma	56	*Oct.
Dierks Lumber & Coal Co.: (See under Holding Companies acquired)	Public Service Co. of Oklahoma	56	*Oct.
McCurtain County Lt. & Pwr. Co. (Dierks Lumber & Coal Co.)	Public Service Co. of Oklahoma	56	*Oct.
Oklahoma Gas & Elec. Co. (Clinton & Elk City)	Southwestern Light & Pwr. Co.	56	*Jan.
Oklahoma Power Co.	Public Service Co. of Oklahoma	56	*April
Oklahoma Utilities Co. (g)	Electric Public Utilities Co	33	Mar.
Public Serv. Co. of Oklahoma: Plants in Coyle, Guthrie, Langston, Mulhall, Perkins & Vinco	Oklahoma Gas & Elec. Co.	13–81	*Feb.

THE PACIFIC COAST IS NOW INTERCONNECTED FROM MONTANA TO MEXICO

Company Involved	Acquiring Company	Holding Company	Date of Merger
Southwestern Light & Pwr. Co. (Gage only)	Oklahoma Gas & Elec. Co.	13–81	*Feb.
Southwestern Lt. & Pwr. Co. (Shattuck only)	Oklahoma Gas & Elec. Co.	13–81	*Jan.
Wright City Elec. Lt. Co. (Dierks Lumber & Coal Co.)	Public Service Co. of Oklahoma.	56	*Oct.
Bessie Municipal Plant	Southwestern Lt. & Pwr. Co.	56	*July
Blair Municipal Elec. Ltg. Plant	Southwestern Lt. & Pwr. Co.	56	*Jan.
Boise City Municipal Light & Power Plant	Cimarron Utilities Co.	.....	*May
Burbank Municipal Distribution & Transmission System	Oklahoma Utilities Co.	33	*April
Fairland Municipal Distr. Sys.	Empire District Electric Co.	19	*July
Fort Cobb Municipal Electric System & H-T Line	Southwestern Lt. & Pwr. Co.	56	*Sept.
Grove Municipal Plant	Public Service Co. of Oklahoma	56	*Dec.
Guyamon Municipal Light & Power Plant	Industrial Utilities Co.	.....	*Feb.
Hinton Municipal Elec. Plant	Southwestern Lt. & Pwr. Co.	56	*April
Leedey Municipal Plant	Southwestern Lt. & Pwr. Co.	56	*July
Marshall Municipal Light & Power Plant	Oklahoma Gas & Electric Co.	13–81	*Oct.
Martha Municipal Plant	Southwestern Lt. & Pwr. Co.	56	*Jan.
Shattuck Municipal Elec. Plant	Oklahoma Gas & Electric Co.	13–81	April
Stratford Municipal Plant	United Power & Light Co.	.....	*July
Tishomingo Munic. Elec. Plant	Oklahoma Gas & Electric Co.	13–81	*July
Oregon			
Bandon Electric Co.	W. A. Hattrem, Portland & J. C. Rowland, Tacoma, Wash.	.....	*May
Condon Electric Co.	¶Sherman Electric Co., Moro.	5–30	*Feb.
Consolidated Electric Light Co.	People's West Coast Hydro-Electric Corp.	73–68	*June
Heppner Water, Lt. & Pwr. Co.	¶Sherman Electric Co., Moro.	5–30	*Feb.
Jensen Light & Power Co.	People's West Coast Hydro-Electric Corp.	73–68	*June
Keno Power Co.	California-Oregon Power Co.	13–81	*April
Molalla Electric Co.	Portland Electric Power Co.	.....	*May
People's West Coast Hydro-Electric Corp. (f)	G. L. Ohrstrom & Co.	68	*April
Prairie Power Co.	People's West Coast Hydro-Electric Corp.	73–68	*June
Sherman Electric Co.	Pacific Power & Light Co.	5–30	*Feb.
Arlington Municipal Plant	¶Sherman Electric Co.	5–30	*Feb.
Fossil Municipal Electric Distributing System	Pacific Power & Light Co.	5–30	*Nov.
Pennsylvania			
Bechtelsville Lt. & Pwr. Co.	Boyertown Electric Co.	11–43	*April
Bryn Athyn Electric Co.	Philadelphia Suburban Counties Gas & Electric Co.	87	*May
Chester Valley Electric Co. (o e)	Day & Zimmermann, Inc.	24–87	*Mar.
Chester County Light & Power Co. (a)	Pennsylvania Gas & Elec. Corp.	1	*Oct.
Citizens Light & Pwr. Co. (o e)	Day & Zimmermann, Inc.	24–87	*Mar.
Counties Gas & Electric Co.	Philadelphia Suburban Counties Gas & Electric Co.	87	*Mar.
Edison Lt. & Pwr. Co. (o e)	Day & Zimmermann, Inc.	24–87	*Mar.
Elwood City Hydro-Elec. Co. (z)	Penn-Ohio Securities Corp.	72	*Mar.
Garrett Electric Light, Heat & Power Co.	Penn Public Service Corp., Johnston	9–95	*Oct.
Glen Rock Electric Light & Power Co. (o e)	Day & Zimmermann, Inc.	24–87	*Mar.
Holtwood Power Co.	Pennsylvania Wtr. & Pwr. Co.	.....	*Aug.
Keystone Power Corp.	West Penn Electric Co.	8	*Nov.
Langhorne Elec. Lt. & Pwr. Co.	Philadelphia Suburban Counties Gas & Electric Co.	87	*May
Mahoning County Lt. Co. (z)	Penn-Ohio Securities Corp.	72	*Mar.
New Hope Electric Co.	Philadelphia Suburban Counties Gas & Electric Co.	87	*May
Pennsylvania Power Co. (z)	Penn-Ohio Securities Corp.	72	*Mar.
Philadelphia Suburban Gas & Electric Co.	Philadelphia Suburban Counties Gas & Electric Co.	87	*May
Plymouth District Power Co.	Philadelphia Electric Co.	.....	*May
Rogersford Electric Co.	Philadelphia Suburban Counties Gas & Electric Co.	87	*May
Sheffield Elec. Lt. & Pwr. Co.	Penn Public Service Corp.	9–95	*Oct
South Coventry Township Electric Co.	Philadelphia Suburban Counties Gas & Electric Co.	87	*May
Spring City Electric Co.	Philadelphia Suburban Counties Gas & Electric Co.	87	*May
Titusville Lt. & Pwr. Co. (o e)	Day & Zimmermann, Inc.	24–87	*Mar.
United Electric Light Co.	Duquesne Light Co.	13–81	*April
Whitpain Power Co.	Philadelphia Electric Co.	.....	*May
Worcester Power Co.	Philadelphia Electric Co.	.....	*May
Coraopolis Municipal Plant	Duquesne Light Co.	13–81	*April
South Carolina			
Laurens Road Light & Pwr. Co.	Southern Public Utilities Co.	26	Oct.
Pendleton Electric Light Co.	Southern Public Utilities Co.	26	*June
South Carolina Gas & Elec. Co.	Southern Power Co.	26	*June
St. Matthews Municipal Electric Light Plant	Broad River Power Co.	11–43	*April
Walterboro Municipal System	Edisto Public Service Co., Denmark	10–96	*Jan.
South Dakota			
Consumers Electric Service Co.	Northwestern Public Service Co.	31–60	*April
Florence Light Co.	Northwestern Public Service Co.	31–60	*June
Garretson Electric Service Co.	Northern States Power Co.	13–81	*Oct.
Hieb Electric Service Co.	Northern States Power Co.	13–81	*April
Hitchock Light & Power Co.	Northwestern Public Service Co.	31–60	*June
Northern Power & Light Co.	United Public Utilities Co.	89	*April
Thompson Electric Light Plant,	Otter Tail Power Co., Fergus Falls, Minn.	69	*June
Wallace Electric Plant	Northwestern Public Service Co.	31–60	*June
Wessington Electric Plant	Northwestern Public Service Co.	31–60	*June
Alexandria Municipal Plant	Northern States Power Co.	13–81	*April
Frederick Municipal Electric Light & Power Plant	United Public Utilities Co. for Northern Power & Light Co.	89	*April
Java Municipal Plant	Northern Power & Light Co.	89	*May
Redfield Municipal Electric Light & Power Plant	Northwestern Public Service Co.	31–60	*June
St. Lawrence Municipal Light & Power Plant	Northwestern Public Service Co.	31–60	*May
Wessington Springs Municipal Electric Plant	Northwestern Public Service Co.	31–60	*May
White River Municipal Hydro-Electric Plant	Dakota Public Service Co.	51–54	*Feb.
Willow Lake Municipal Plant	Northwestern Public Service Co.	31–60	*Feb.
Tennessee			
Bristol Gas & Electric Co.	Tennessee Central Service Co.	19	Feb.
Public Light & Power Co. (z)	United Utilities & Service Corp.	92	*Mar.
Public Service Co.	Tennessee Electric Power Co.	19	*July
Southern Cities Power Co. (z)	United Utilities & Service Corp.	92	*Mar.
Tiptonville Electric Plant	Union Electric & Gas Co. for Southern Utilities Co.	86–41	*Mar.
Watauga Power Co.	Tennessee Central Service Co.	19	Feb.

Company Involved	Acquiring Company	Holding Company	Date of Merger
Gallatin Municipal Light & Water Plant	Kentucky-Tennessee Light & Power Co	9-95	*Aug.
Puryear Municipal Elec. Plant	Kentucky-Tennessee Light & Power Co	9-95	*April
Ridgley Municipal Electric & Water Plant	Union Electric & Gas Co. for Southern Utilities Co	86-41	*Mar.
Trezevant Munic. Ltg. Plant	Kentucky-Tenn. Lt. & Pwr. Co.	9-95	*Dec.
Texas			
Angleton Light & Ice Co	Texas Gulf Power Co	84	*May
Athens Light & Power Co	Texas Pwr. & Lt. Co., Dallas (x)	5-30	*June
Big Lake Utilities Co	West Texas Utilities Co	56	*April
Central Power & Light Co.: Childress, Clarendon, Estelline, Kirkland, Memphis, Shamrock, Verna & Wellington	West Texas Utilities Co	56	*Oct.
Citizens Utilities Co	Central Texas Light & Power Co., San Antonio	.....	*April
Community Power & Light Co. of Texas (b)	American Comwlth. Pwr. Corp.	6	*June
Dalhart Ic & Electric Co	Dalhart Public Service Co. (j)	46	May
Dalhart Public Service Co. (j)	Insull Son & Co, Inc	46	*Oct.
Dickinson Electric Co	Texas Gulf Power Co	84	*May
East Texas Public Service Co	Southwestern Gas & Electric Co.	56	*June
Freeport Lt. Wtr. & Gas Co.: Tallbut, Bryan & Hoskins Mounds plants	Houston Lighting & Power Co.	61-30	*June
Henderson Light & Ice Co	¶East Texas Public Service Co.	56	*Jan.
League City Light & Power Co.	Texas Gulf Power Co	84	†
Leander Elec Lt & Pwr. Plant	Texas Pwr. & Lt. Co., Dallas (x)	5-30	Oct.
Lone Star State Power Co	San Antonio Pub. Serv. Co	4	*July
Lone Star State Power Co	Texas Pwr. & Lt. Co., Dallas (x)	5-30	*Oct.
McCarney Light & Power Co	West Texas Utilities Co	56	*May
Midland Light Co	Texas Pwr. & Lt. Co., Dallas (x)	5-30	*Mar.
Pearson & Johnson	Central Texas Light & Power Co., San Antonio	.....	*Apr.
Pelly Light Co.: Addison, Barbers Hill, Cedar Bayou, Crosby, Pringle & Wooster	Houston Lighting & Power Co.	61-30	*Nov.
Quanah Ice & Light Co	West Texas Utilities Co	56	*Sept.
San Angelo Water, Light & Power Co	West Texas Utilities Co	56	Oct.
Spur Light & Power Co	West Texas Utilities Co	56	*Feb.
Texas City Elec. Lt. & Wtr. Co.	Texas Gulf Power Co	84	Oct.
Texas Utilities Co. (b)	American Comwlth. Pwr. Corp.	6	*June
Twin City Ice & Electric Co	West Texas Util. Co., Abilene	56	*Nov.
Venus Lighting & Water Co	Texas Pwr. & Lt. Co., Dallas (x)	5-30	*Mar.
West Columbia Lt. & Pwr. Co	Texas Gulf Power Co	84	†
Yoakum Light & Power Co	Texas-Louisiana Power Co	84	*April
Clifton Municipal System	Texas-Louisiana Power Co	84	Jan.
Eldora Municipal Plant	West Texas Utilities Co	56	*April
McLean Municipal Plant	Southwestern Public Service Co	24-87	Jan.
Nacogdoches Municipal Power Plant	Texas Power & Light Co. (x)	5-30	*July
Perryton Municipal Electric Light Plant	Inland Utilities Co	.....	*Jan.
Shamrock Municipal Electric Light & Power Plant	Central Power & Light Co	56	*May
Sonora Municipal System	West Texas Utilities Co	56	*April
Vermont			
Clyde River Power Co	Public Utilities Vermont Corp.	76-40	*May
Eastern Vermont Public Utilities Corp	D. L. McDaniel of New York	.....	*Nov.
Ottauguechee Woolen Co. (water rights at Evarts)	New England Power Co	64	*April
People's Hydro Electric Vermont Corp. (l)	G. L. Ohstrom & Co	68	*April
Public Utilities Vermont Corp.	Public Util. Consolidated Corp.	76-40	*June
Stamford Light, Heat & Power Co. (h, l)	Massachusetts Utilities Investment Trust	71-55	May
West Enosburg Elec. Plant Corp.	Municipality of Enosburg Falls	.....	Oct.
Readsboro Munic. Ltg. System	New England Power Co	64	Jan.
Virginia			
Citizens Gas & Electric Co	Consumers' Util. Co., Staunton	.....	*Feb.
East Coast Utilities Co. (Hopewell only)	Virginia Electric & Power Co	35-82	*April
Eastern Shore Gas & Electric Co. of Virginia (o e f)	Eastern Shore Gas & Electric Co	62-42-24-87	Mar.
Prince George Electric Light & Power Co	Virginia Electric & Power Co	35-82	*April
Roanoke Fibre Board Co. (Riparian rights at Roanoke Rapids)	Virginia Electric & Power Co	35-82	*June
Rocky Mount Lt. & Pwr. Co. (a)	Pennsylvania Gas & Elec. Corp.	1	*Oct.
Shenandoah River Power Co	Atlantic Public Utilities, Inc.	10-96	*April
Virginia East Coast Utilities Co.	East Coast Utiiities Co	27	†
Virginia Public Service Co. (e)	Day & Zimmermann, Inc	24-87	*Mar.
Winchester Gas & Electric Co	Consumers' Util. Co., Staunton	.....	*Feb.
Cape Charles Municipal Plant & Distribution System	Eastern Shore Gas & Electric Co. (e) for Exmore Pwr. & Lt. Co	62-42 24-87	*Sept.
Clarksville Municipal Electric Power Plant	Virginia Public Service Co	62-42 24-87	*Sept.
Shenandoah Municipal Electric & Water Works Plants	Page Power Co	.....	*Nov.
South Hill Municipal Plant	Virginia Public Service Co	62-42 24-87	*Aug.
Washington			
Clark County Water, Light & Power Co	Ridgefield Light & Power Co., which leased property to Northwestern Electric Co	5-30	*Nov.
Longview Public Service Co	Washington Gas & Electric Co.	91	*Jan.
Mountain States Power Co.: Monroe, Snohomish & Cherry Valley District in Snohomish County	Puget Sound Power & Light Co.	82	*Oct.
Northwest Light & Power Co	Public Util. Consol. Corp	76-40	*Aug.
Skykomish Municipal Light & Power Plant	Puget Sound Power & Light Co.	82	*Sept.
West Virginia			
West Virginia Utilities Co. (properties at Morgantown & Cameron)	West Virginia Public Service Co.	8	*June
West Virginia Utilities Co. (v)	United Util. & Service Corp	92	*Mar.
Wheeling Public Service Co. (v)	United Util. & Service Corp	92	*Mar.
Wisconsin			
Aurora Elec. Lt. & Pwr. Co	Wisconsin Michigan Power Co.	65	*July
Badger Utility Co	Wisconsin Michigan Power Co.	65	*July
Kekoskee Light & Power Co	Northwestern Light & Power Co., Cedar Rapids, Iowa	.....	*Jan.
Lindsay Light & Power Co	Wisconsin Power & Light Co	56	*July
Niagara Light & Power Co	Wisconsin Michigan Power Co.	65	*July
Northern Wisconsin Hydro-Elec. Power Co. (Bayfield only)	Municipality of Bayfield	.....	*June
Peninsular Power Co	Wisconsin Michigan Power Co.	65	*July
People's Wisconsin Hudro-Electric Corp. (l)	G. L. Ohrstrom & Co	68	*April
Sauk County Utilities Co	Wisconsin Power & Light Co	56	*Mar.
Southern Wisconsin Power Co	Wisconsin Power & Light Co	56	*Jan.
Star Electric Light, Heat & Power Co	Wisconsin Michigan Power Co.	65	*July
Trenton Power & Light Co	Wisconsin Power & Light Co	56	*Feb.
Waupaca Electric Service & Railway Co	Wisconsin Valley Electric Co	13-81	*Oct.
Weyauwega Electric Light Co	Wisconsin Michigan Power Co.	65	*July
Wisconsin Michigan Power Co	The North American Co	65	*July
Wisconsin Northern Light, Heat & Power Co. (Electric lines in vicinity of Mosinee)	Wisconsin Valley Electric Co	13-81	*June
Wisconsin Northern Light & Power Co	Wisconsin Michigan Pwr. Co	65	*July
Wisconsin River Power Co	Wisconsin Power & Light Co	56	*Jan.
Wisconsin Traction, Light, Heat & Power Co	Wisconsin Michigan Power Co.	65	*July
Wisconsin Valley Electric Co	Standard Gas & Electric Co	13-81	*Oct.
Wisconsin Valley Power Co	Standard Gas & Electric Co. through Wisconsin Valley Electric Co. (y)	13-81	*Oct.
Granton Municipal Transmission Line & Distribution System	Northern States Power Co	13-81	*Feb.
Rice Lake Municipal Plant	Northern States Power Co	13-81	*Feb.
Wausau Municipal Distribution System	Wisconsin Valley Electric Co	13-81	Oct.
Canada			
Bonhomme Electric Plant	Gatineau Power Co	48	*Feb.
Canadian Light & Power Co	Shawinigan Water & Power Co.	79	*Aug.
Compagnie Electrique de Bellechasse	Quebec Power Co	79	*Aug.
Compagnie d'Energie Electrique de Montmagny	Quebec Power Co	79	*Aug.
Donat Hydro-Electric Plant	¶Quebec Southern Power Co	48	*May
Eastern Canada Power Co	Shawinigan Water & Power Co.	79	*Jan.
Eastern Electric & Development Co	Canada Electric Co., Amherst, N. S	.....	*Oct.
Fort William Paper Co	Abitibi Power & Paper Co., Ltd.	.....	*Oct.
Gatineau River Power Co., Ltd.	Gatineau Power Co	48	June
La Compagnie Hydro-Electrique de L'Annonciation	¶Quebec Southern Power Corp.	48	*Mar.
Manitoba Paper Newsprint Plant	Abitioi Power & Paper Co., Ltd.	.....	*Oct.
Maniwaki Pwr. & Tel. Co	Gatineau Power Co	48	*Mar.
Montreal Hydro-Elec. Co., Ltd.	Consolidated Securities, Ltd.	90	†
Ottawa & Hull Power Co., Ltd.	Gatineau Power Co	48	*June
Ottawa-Montreal Power Co.: (Developed power sites at Van Kleek Hill, Vaudreuil, Coteau Jct., Rockland, etc)	Gatineau Power Co	48	*June
Papineauville Electric Co	Gatineau Power Co	48	*Feb.
Quebec Southern Power Corp.	Gatineau Power Co	48	*July
Rosetown Electric Light & Power Co.,Ltd	International Utilities Corp	50-18	*June
Spanish River Newsprint Plant	Abitibi Power & Paper Co., Ltd	.....	*Oct.
Valleyfield Electric Co	Shawinigan Water & Power Co., through and for Beauharnois Electric Co	79	*Aug.
Watrus Elec. Lt. & Pwr. Co	International Utilities Corp	50-18	*June
Laurenburg (N.S.) Municipal System	Laurenburg Gas Co., Ltd	.....	†
Foreign			
Companhia Brazileira de Energia Electrica	International General Elec. Co.	47	*April
Companhia Linha Circular de Carros da Bahia	International General Elec. Co.	47	*April
Companhia Trilhos Centraes	International General Elec. Co.	47	*April
L'Energie Industrielle	Foreign Power Securities Corp.	39	Mar.
L'Union Hydro-Electrique Armoricaine	Foreign Power Securities Corp.	39	Mar.
Macoris Light & Power Co	Islands Edison Co	44	*Oct.
Panama-Colon Gas Co	American & Foreign Power Co., Inc	2-30	*June
Porto Rico Railways, Light & Power Co. (u)	International Power Co., Ltd.	49	*April
Societe Hydro-Electrique du Sud-Est	Foreign Power Securities Corp.	39	Mar.

Utilities Raise $2,128,000,000

Low money rates and increased budget demands create unprecedented volume of financing. More than billion added to capitalization. Refunding operations active

By H. M. Cameron
Financial Editor

BREAKING the highest previous record in financing by nearly 50 per cent, the power and light industry last year absorbed the stupendous total of well over two billion dollars. Such a program has never been exceeded by any single industry in a corresponding space of time. This large sum represented one-fourth of all the financing done in the public money markets of this country. About half of it represented refinancing at lower rates of interest and the balance was required for expenditures in the properties.

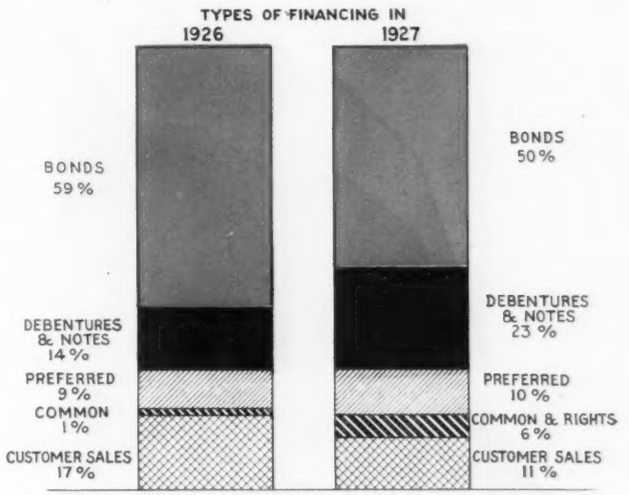
The industry's refinancing program called for $879,000,000. Not only have such operations brought about a huge saving in interest charges—probably ten to fifteen millions annually—but they have also promoted simplification and strengthening of capital structures in a large way. Scores of corporate issues bearing higher interest rates than those now ruling have been retired and replaced by lower-priced obligations. The saving frequently has been as high as 1½ to 2 per cent. Economies of this nature are comparable, in so far as their benefits to the industry are concerned, to lower construction or operating costs; they place the companies in a position to show better earnings on their junior securities. Public utility companies incidentally are able to reap greater benefit from refinancing than most industrial concerns, since a larger proportion of their capital normally is in the form of interest-bearing obligations.

In comparison with the past few years all classes of financing show the downward trend of money rates. Mortgage bonds were marketed at an average rate of 5.00 per cent, against an average of 5.40 per cent in 1926 and of 6 per cent in 1924. A substantial number of large issues were floated during the year on a 4½ per cent basis—a situation until recently without precedent during the present decade. There is little in the current situation to indicate any change in the present downward trend of rates within the near future.

Electric Light and Power Securities in 1927

Public Sales by Investment Houses

	Amount of Issue	
Mortgage Bonds (average yield 5.00 per cent)		
12 issues yielding from 4.55 to 4.75 per cent...	$266,200,000	
14 issues yielding from 4.78 to 4.95 per cent...	234,052,000	
17 issues yielding from 5.00 to 5.10 per cent...	162,562,000	
18 issues yielding from 5.11 to 5.18 per cent...	254,136,000	
17 issues yielding from 5.20 to 5.25 per cent...	86,372,000	
11 issues yielding from 5.27 to 5.54 per cent...	34,850,000	
13 issues yielding from 5.60 to 5.95 per cent...	36,764,000	
12 issues yielding from 6.00 to 6.20 per cent...	15,209,000	
8 issues yielding from 6.25 to 6.60 per cent...	17,525,000	
122 issues		$1,107,670,000
Debentures (average yield 5.69 per cent):		
5 issues yielding from 5.00 to 5.20 per cent...	104,500,000	
7 issues yielding from 5.28 to 5.53 per cent...	73,500,000	
5 issues yielding from 5.65 to 5.75 per cent...	103,500,000	
6 issues yielding from 6.00 to 6.25 per cent...	67,000,000	
6 issues yielding from 6.32 to 6.88 per cent...	9,650,000	
29 issues		358,150,000
Notes (average yield 4.09 per cent)		
4 issues yielding from 4.25 to 5.25 per cent...	42,300,000	
8 issues yielding from 5.75 to 6.00 per cent...	13,062,500	
3 issues yielding from 6.15 to 6.75 per cent...	3,250,000	
1 issue	4,200,000	
16 issues		62,812,500
Preferred Stock (average yield 6.16 per cent)		
7 issues yielding from 5.12 to 5.88 per cent...	56,610,000	
9 issues yielding from 6.00 to 6.09 per cent...	58,320,700	
8 issues yielding from 6.10 to 6.47 per cent...	33,832,500	
11 issues yielding from 6.63 to 7.00 per cent...	45,689,000	
5 issues yielding from 7.07 to 7.25 per cent...	7,140,000	
5 issues yielding from 7.29 to 7.37 per cent...	7,210,000	
45 issues		208,802,200
Common Stock		
2 issues		6,200,000
Rights and warrants		145,274,564
Total of all issues of year		$1,888,909,264
Estimated local sales to customers		240,000,000
		$2,128,909,264



FIFTY PER CENT OF LIGHT AND POWER FINANCING IN 1927 WAS IN BONDS

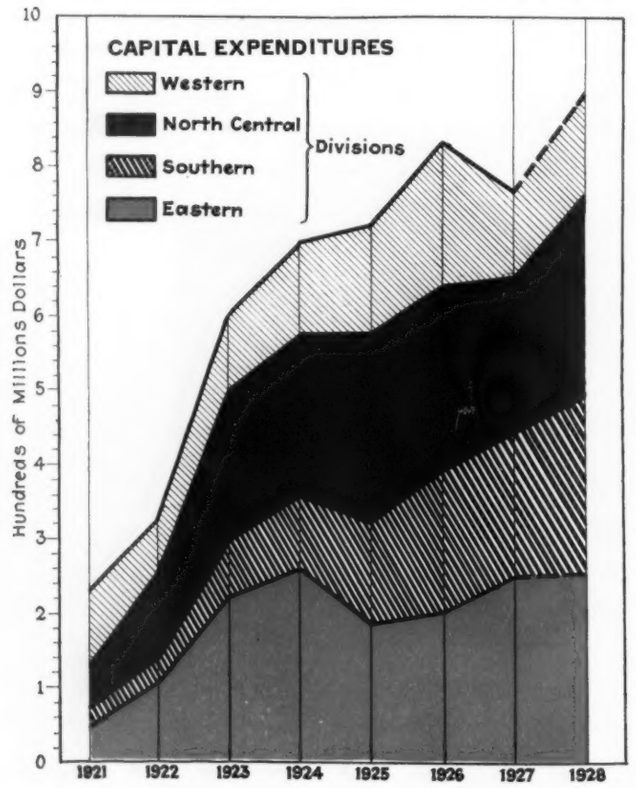
Debentures were sold at an average yield of 5.69 per cent, against 6.20 per cent in 1926. The average on notes was 4.09, against 5.50 per cent, and on preferred stock 6.16, against 6.84 in 1926.

Despite the unusually favorable bond market that has existed throughout 1927, with the exception of a few weeks in summer when there was a temporary oversupply, bond financing constituted a smaller proportion of the total than in 1926. The percentage of publicly sold issues was 52, against 59. The aggregate dollar value of bonds sold, however, exceeded the 1926 total by $294,000,000. There was only a slight change from the previous year in debenture and note financing, which constituted 17 per cent of the total, against 15 per cent in 1926. Preferred stock sold publicly accounted for 10 per cent of the total, against 8, and the volume of customer sales, as discussed in detail elsewhere, fell

off to 11 per cent of the total, against 17 per cent in 1926.

For some years it has been the practice of certain of the power and light companies, as well as leading industrial corporations, to raise a portion of their capital requirements directly from their shareholders by issuing rights or option warrants for the purchase of stock. Although there has been no attempt in our previous annual summaries to compute and include totals for such financing, account of it has been taken during 1927. The aggregate of rights and warrants presumed to have been exercised, or in any event underwritten, was $145,274,564. For purposes of convenience the date of offering is taken as the date of the financing in view of the impossibility of tracing the actual raising of the funds through the execution of the rights. Obviously comparisons with totals for previous years are inaccurate unless account be taken of this item not previously included.

Although much effort has been expended during 1927 toward securing legalization of utility securities for savings bank and trust investment, little of a tangible nature has yet been accomplished. Savings bank and trust



NORTH CENTRAL AND SOUTHERN UTILITIES PLAN LARGEST INCREASE IN CAPITAL EXPENDITURES, WHILE EAST AND WEST CONTINUE AT PRESENT RATE

Revenue and Expenses During 1927

	Gross Revenue	Operating Costs	Net Revenue
January	$162,000,000	$63,900,000	$98,100,000
February	162,300,000	61,300,000	91,000,000
March	146,200,000	63,000,000	83,200,000
April	145,700,000	62,100,000	83,600,000
May	140,600,000	62,200,000	78,400,000
June	138,700,000	62,600,000	76,100,000
July	134,300,000	62,400,000	71,900,000
August	135,600,000	63,000,000	72,600,000
September	145,300,000	63,700,000	81,600,000
October	154,000,000	67,400,000	86,600,000
November	159,000,000	65,600,000	93,400,000
December	170,000,000	69,500,000	100,500,000
	$1,783,700,000	$766,700,000	$1,017,000,000

company funds available for investment have multiplied rapidly during the past decade, whereas there has been virtually no extension in the volume of securities authorized for such investment. Few would dispute the safety and suitability of power and light company bonds for this purpose, but the general public, and legislators in particular, appear to need much more education along these lines. Institutional buying, however, on the part of insurance companies, investment trusts and other financial and fiduciary institutions has expanded materially during the year.

Supplementing the normal growth of the industry, aggressive business promotion during 1927 produced an 8 per cent rise in gross revenues over 1926. At the same time operating costs increased only 6 per cent, allowing for a growth of almost 10 per cent in net revenues. Gross and net revenue and operating cost figures for the year by months are given in the accompanying table.

A significant trend evident in statistics of the power and light industry over a period is the steady reduction in the operating ratio. During the period covered in the attached statistical analysis, the ratio has been gradually reduced from 50 per cent in 1920 to 43 in 1927. This, in the face of stable if not lowered rates to consumers, may be regarded as an achievement in the administration of the utility industry. It is due in no

Six-Year Record of Financing

1922	$589,960,000
1923	997,722,000
1924	1,175,121,000
1925	1,278,223,000
1926	1,384,665,000
1927	2,128,909,000
Total	$7,554,600,000

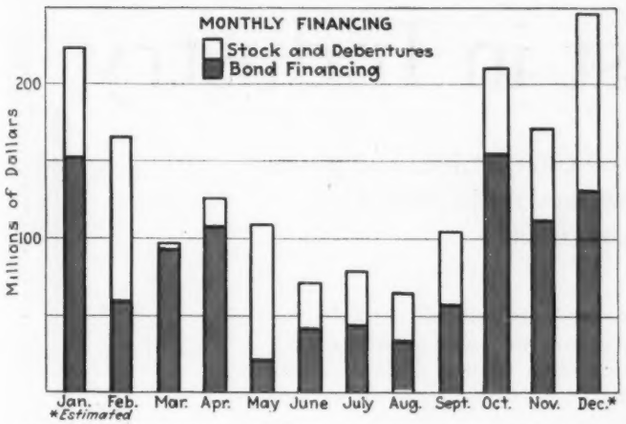
small part to the economics resulting from merger and interconnection developments. The analysis of revenue received in relation to power generated and customers served shows the earning position of the industry during the period since 1920.

The total capitalization, as defined by the ELECTRICAL WORLD, of the light and power industry at the end of 1927 amounted to $9,500,000,000. This sum is the

Eight Years' Progress of the Power Industry

	Gross Revenue	Over Previous Year, Per Cent	Net Revenue	Over Previous Year, Per Cent	Operating Ratio, Per Cent	Gross per Kilowatt-Hour Generated (Cents)	Kilowatt-Hour Generated per Customer*	Gross Revenue per Customer (Electric)
1920	$882,750,000	14	$442,750,000	..	50	2.5	3,810	$85.3
1921	944,400,000	7	512,000,000	16	46	2.5	3,280	84.0
1922	1,072,120,000	14	590,550,000	15	45	2.5	3,570	87.9
1923	1,269,550,000	18	692,670,000	17	45	2.5	3,750	92.7
1924	1,354,570,000	7	736,590,000	6	46	2.5	3,480	86.4
1925	1,480,500,000	9	830,500,000	13	44	2.5	3,470	84.0
1926	1,652,300,000	12	929,300,000	13	44	2.5	3,580	85.4
1927	1,783,700,000	8	1,017,000,000	9	43	2.3	3,590	85.1

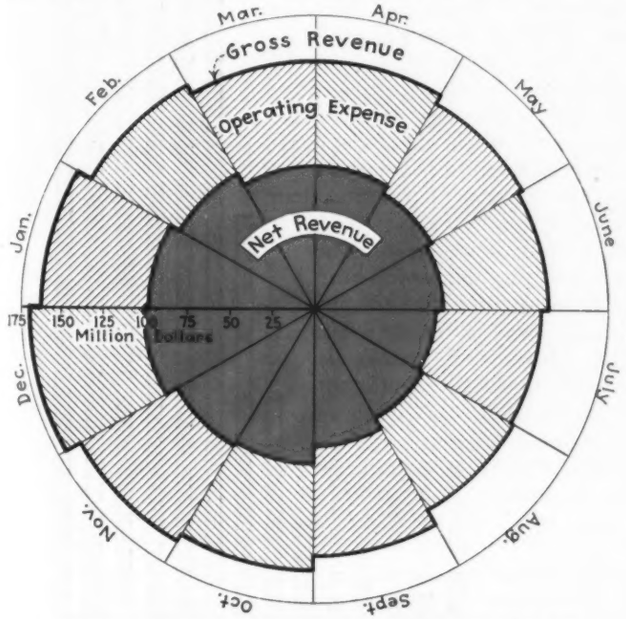
*Average number of customers at beginning and end of year.



VOLUME OF FINANCING REACHED UNPRECEDENTED LEVELS AT END OF 1927

aggregate capitalization of the operating companies and the holding companies. It contains duplication in that the common stock of an operating company is held by a holding company and, in theory at least, the capitalization of the holding company should equal the aggregate amount of the common stocks of operating companies which it holds. Thus this duplication involves the common stock. Another complication occurs in that many holding companies own stocks of industrials, gas companies, water companies and railroads in addition to utilities, so that their capitalization is based on a total stock holding in excess of their operating light and power company stocks. Further, it may be noted that the capitalization used represents face value of securities when issued.

In computing the capitalization figure the census of 1922 was taken as a basis, and for each year since that time annual totals of securities sold are added after that portion used for refunding purposes is deducted. Since many holding companies finance for their operating companies and since many inter-company security holdings exist, it is very difficult to make a tabulation that separates the capitalization of operating and holding companies. The census of this year will make available the capitalization of the operating companies and with those data it will be possible to subdivide the capitalization figure used in this issue. But as an industry statistical fact the total capitalization should be given to show relative changes each year.



OPERATING COSTS ARE PRACTICALLY UNIFORM, WHILE NET REVENUE IS HIGHEST IN WINTER MONTHS

Markets Forge Upward to New Levels in 1927

Disregarding threatened market break and possible effect of federal investigation, investors accumulate utility stocks in unprecedented volume

HEAVY investment accumulation of utility stocks in unprecedented volume, forcing averages to new high levels, is the story of the utility markets during 1927. With one or two exceptions, prices reached new high averages every month of the year. Disregarding such factors as a threatened break in stock exchange prices and the possible psychological effect

UTILITY STOCKS FLUCTUATE WITHIN NARROWER RANGE THAN INDUSTRIALS

of a federal investigation, investors have shown implicit confidence in the future of the power and light industry and in the soundness of its securities.

Illustrating the action of the markets more specifically, the accompanying graph of the average of fifteen power and light common stocks registers a net advance of 35 points since the beginning of the present movement in April, 1926. Of this advance, approximately 25 points were made during 1927. Collectively, the companies included constitute more than one-third of the industry in gross revenue and may, therefore, be regarded as representative. The importance of this advance, in dollar values, is shown by a study of the change in aggregate market value of these stocks during the period. The total value at the beginning of the period was $1,658,000,000 and at the end $2,136,000,000, showing a net appreciation of $478,000,000, or 29 per cent.

Preferred stocks have shown a steady and consistent appreciation during the year. Levels are now several points above those of last January and investment buying in these issues has shown a definite expansion.

Bond values also registered a steady advance during 1927. Demand for high-grade power and light issues, both for private and for institutional investment, has increased steadily. Under this influence, yields have been steadily reduced until financing has recently been carried on by some of the leading companies on a 4½ per cent basis—the lowest level in nearly twenty years.

Customers Invest in Industry

Customer ownership sales approach $240,000,000. Light and power securities widely held. 343,000 transactions in twelve months. Average sale about $700

DESPITE MONEY market conditions which favored utility financing by the floating of securities in financial centers, the practice of selling stock locally to customers and employees was continued in 1927 at virtually the same pace as in the preceding year. In the twelve months beginning with November, 1926, the total sales, as indicated by monthly reports to the ELECTRICAL WORLD, aggregated $248,325,000; the number of transactions was 376,400, and 3,516,000 shares were sold. For the calendar year 1927 it is estimated that sales will amount to $240,000,000 or slightly more in value and that about 3,480,000 shares will have been sold in 343,000 transactions. The average is close to $700 per transaction. The odd average of $69 per share is due to the influence of a considerable number of shares at other than $100 par, notably the large sales of $25 shares by one prominent company.

Comparison with 1926 indicates that the money value of securities sold was about the same in both years, but there was a wider distribution of sales. In the earlier year, according to the report of the customer-ownership committee of the National Electric Light Association, companies reporting sold 2,686,187 shares, valued at $236,557,100 in 248,867 transactions. The shares, therefore, increased by 30 per cent and the number of transactions by 37 per cent.

From the data at hand, a segregation of repeated sales to the same purchaser is impossible. The report previously mentioned gives the number of customer and employee stockholders at the end of 1926 as 1,432,277. Whether these are all different individuals or whether the figure is the sum of the number of sales is not clear. In either case, it indicates broad dissemination of the securities in the territory served.

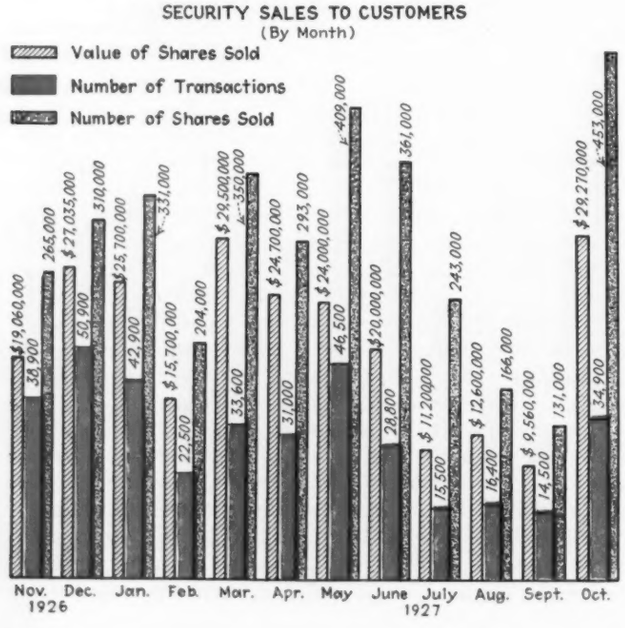
Adding to the given number the transactions in 1927 results in a total close to 1,800,000. This would mean a stockholder for every ten residential customers, if repeat sales have been excluded; it means, in any event, a sale for every ten present-day customers. Most of this has been achieved since 1920.

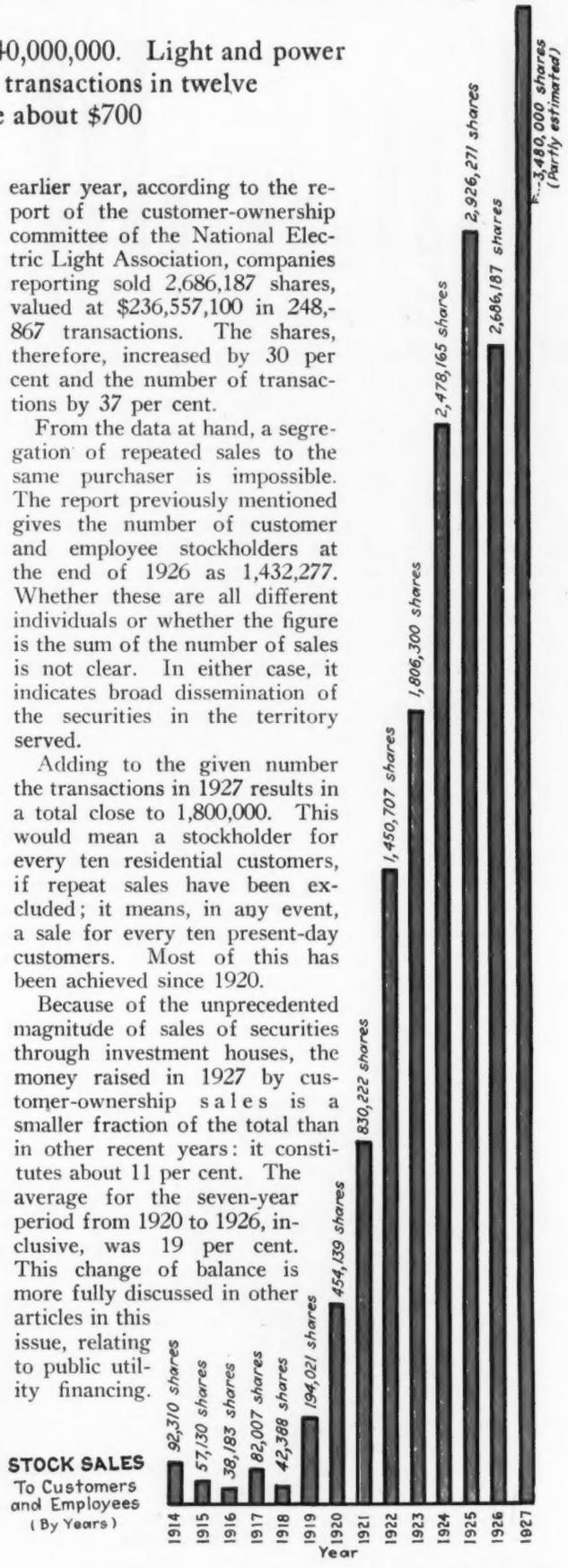
Because of the unprecedented magnitude of sales of securities through investment houses, the money raised in 1927 by customer-ownership sales is a smaller fraction of the total than in other recent years: it constitutes about 11 per cent. The average for the seven-year period from 1920 to 1926, inclusive, was 19 per cent. This change of balance is more fully discussed in other articles in this issue, relating to public utility financing.

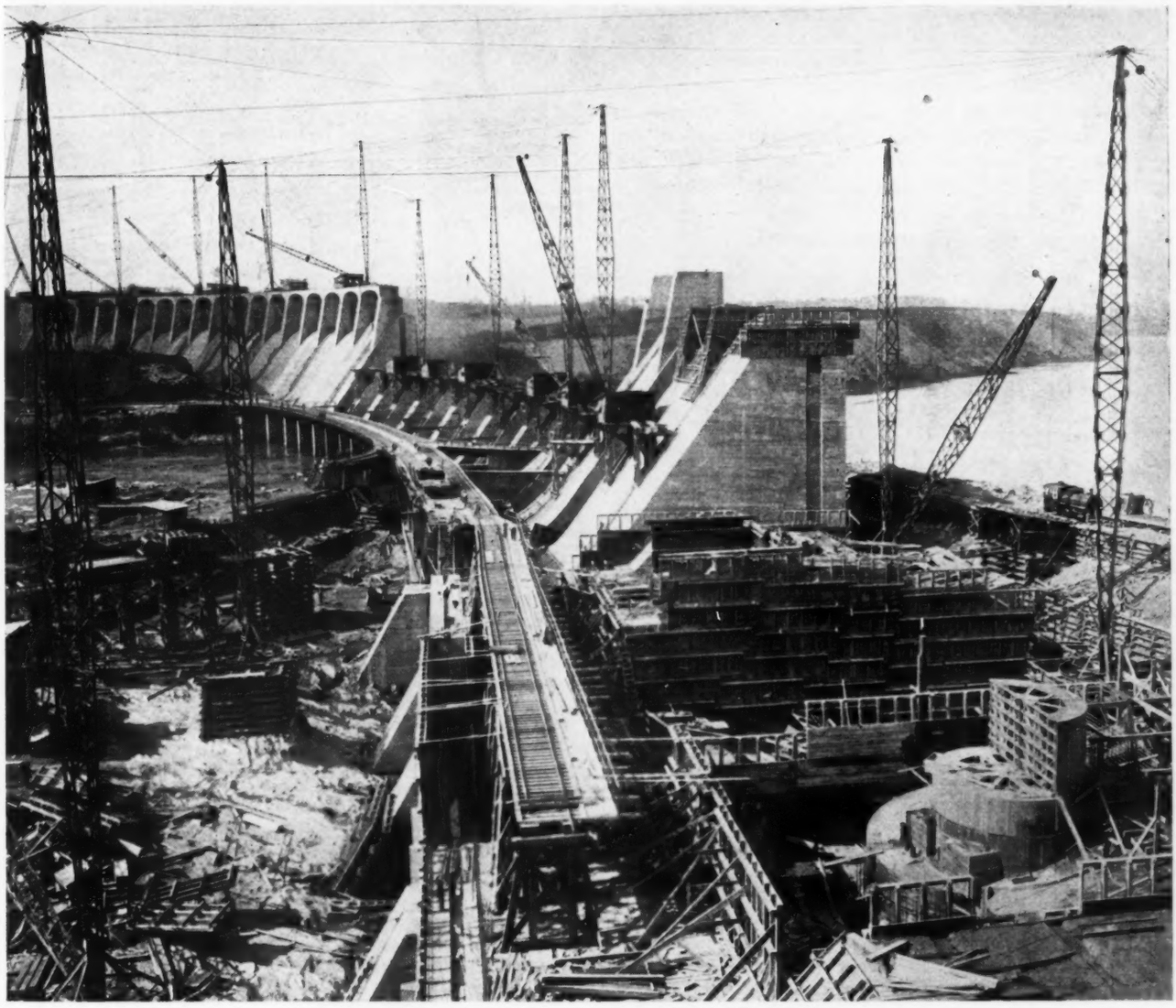
Security Sales 1920-1927, Inclusive

	Sales by Investment Houses	Sales Direct to Customers	Per Cent Direct to Customers
1920	$326,374,000	$43,000,000	11.7
1921	458,917,000	80,000,000	14.8
1922	589,961,000	130,000,000	18.1
1923	747,722,000	175,000,000	19.0
1924	982,421,000	254,000,000	20.6
1925	982,223,000	297,561,800	23.2
1926	1,150,965,000	236,557,100	17.1
1927	1,888,909,000	240,000,000†	11.3
Total 1920–1927	$7,127,492,000	$1,456,118,900	17.0

† November and December estimated.







JORDAN DAM (ALA.) PLANT TO CONTAIN FOUR 29,000-KVA. UNITS

$273,000,000 for 1928 Stations

About 3,000,000 kva. to be added to utility generating capacity. Building of plants to occur in all regions. West coast goes to steam stations.

SERVICE demands in the light and power industry increase at a rate that calls for the addition of more than a million kilovolt-amperes to generating stations each year. Budget reports indicate an expenditure in 1928 for power stations aggregating $273,000,000, as compared with $235,000,000 in 1927. The 1928 expenditure will be $183,000,000 for steam plants and $90,000,000 for hydro plants.

Power-plant building occurs in all areas. In several large metropolitan systems the program for 1928 calls for additions to existing stations. In regions of heavy load density new stations are contemplated and in areas where transmission-line building has been active large stations are built to supply the system. With the extension of transmission systems small and inefficient stations in small towns become stand-by or peak-load plants and the bulk of the energy is supplied from large, efficient plants. A striking development for 1928 is the program for building many steam stations on the Pacific Coast and in the South—regions noted for waterpower resources. Two reasons exist for this trend, the chief one being costs and the other being the need for a local power supply to insure reliable service to metropolitan communities served by transmission systems.

Under federal waterpower license a total of 680,826 hp. is scheduled to go into operation in 1928, as compared with 91,194 hp. in 1927. Other large hydro projects are contemplated for the South, and the Conowingo develop-

ment should start operations. Waterpowers which can be developed economically continue to be in favor, and several large projects await development only because of political or other restrictions.

The accompanying tables give a detailed analysis of power-station building programs for each location, but does not contain certain large stations for which preliminary plans are made and which will be started in 1928. Evidence is available to show that 1928 and 1929 will be very active in power-plant building.

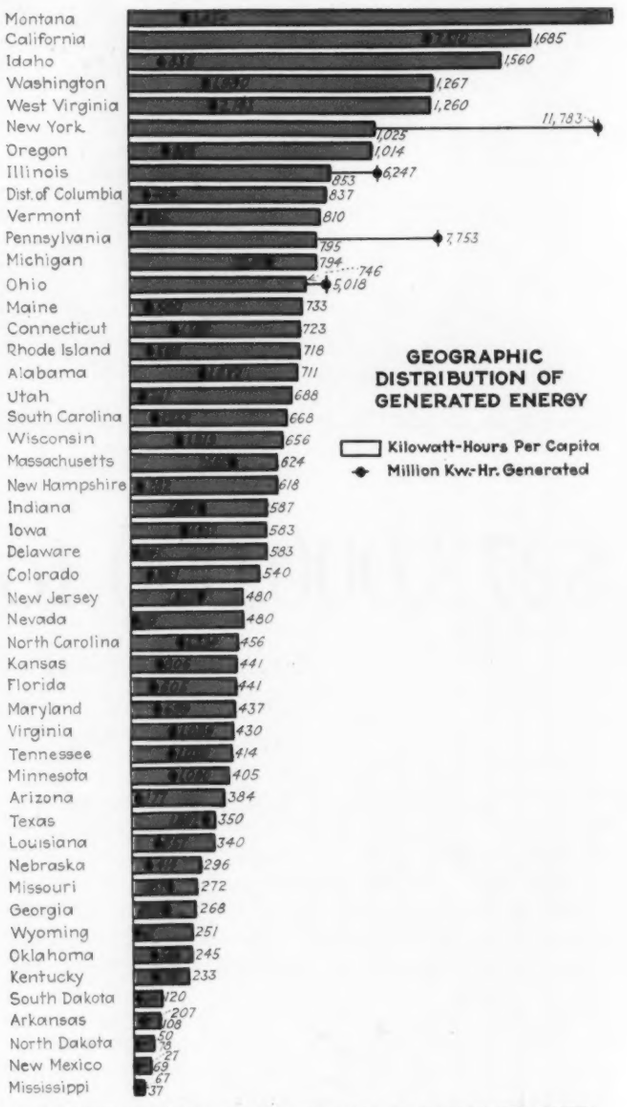
Table I—New Installations Completed During 1927

Division	Hydro Hp.	Hydro Estimated Kva.	Steam Estimated Kva.	Total Estimated Kva.
New England	98,000	91,600	60,000	151,600
Middle Atlantic	156,000	145,800	727,500	873,300
South Atlantic	108,000	100,900	270,900	371,800
East North Central	2,000	1,900	940,000	941,900
East South Central	108,000	100,900	38,700	139,600
West North Central	28,000	26,200	82,300	108,500
West South Central	105,200	98,300	199,200	297,500
Mountain	143,200	133,800	7,200	141,000
Pacific	420,200	392,700	308,800	701,500
Total	1,168,600	1,092,100	2,634,600	3,726,700

Table II—Steam-Electric Generating Plants Completed in 1927, Now Under Construction, or Definitely Planned for an Early Start, Including Additions to Existing Installations

Company	Station	Initial or Added Capacity, Kw.	Scheduled Date of Operation	Ultimate Capacity, Kw.
New England States				
Edison Elec. Illuminating Co.	Edgar	*60,000	1927	.....
United Illuminating Co.	English	32,500	1928	32,500
Middle Atlantic States				
American Gas & Electric Co., Pennsylvania Pwr. & Lt. Co.	Stanton, Pa.	100,000	1927	400,000
Binghamton Lt., Ht. & Pwr. Co.	Westover	35,000	1928	.....
Buffalo General Electric Co.	Charles R. Huntley	60,000	1927	.....
Buffalo General Electric Co.	Charles R. Huntley	75,000	1928	.....
Duquesne Light Co.	Colfax	188,500	1927	500,000
Duquesne Light Co.	Shippingport	*70,000	1928	.....
Elmira Water, Light & R.R. Co.	Elmira	6,000	1927	.....
Jersey Central Pwr. & Lt. Co.	Whippany	*20,000	1927	.....
New Jersey Power & Light Co.	Holland	40,000	1928	250,000
New York Edison Co.	East River	*130,000	1927	*750,000
New York Edison Co.	Hell Gate	*130,000	1927	.....
Rockland Light & Power Co.	Hillburn	5,000	1927	.....
South Atlantic States				
Appalachian Electric Power Co.	Cabin Creek, W. Va.	31,500	1927	.....
Appalacian Electric Power Co.	Glenlyn, Va.	25,000	1927	.....
Appalachian Electric Power Co.	Kenova, W. Va.	25,000	1927	.....
Appalachian Electric Power Co.	Roanoke, Va.	*7,500	1927	.....
Delmarvia Power Co.	Vienna, Md.	12,000	1927	.....
Eastern Shore Public Serv. Co.	Vienna, Md.	12,000	1928	.....
Florida Power & Light Co.	Lauderdale	25,000	1927	150,000
Jacksonville, Fla.—Municipal	Jacksonville	*30,000	1927	.....
Potomac Electric Power Co.	Bennings	*35,000	1927	.....
South Carolina Power Co.	Charleston	10,000	1927	.....
Virginia Electric & Power Co.	Norfolk	30,000	1927	.....
East North Central States				
Central Illinois Pub. Serv. Co., Commonwealth Edison Co., Illinois Power & Light Corp., Public Serv. Co. of No. Illinois	Powerton	52,000	1928	.....
Commonwealth Edison Co.	Crawford Ave.	*200,000	1927	.....
Commonwealth Edison Co.	Crawford Ave.	100,000	1928	.....
Consumers Power Co.	Kalamazoo	20,000	1927	.....
Detroit Dept. of Public Lighting	Morrell St.	60,000	1927	.....
Detroit Edison Co.	Delray No. 3	100,000	1928	400,000
Detroit Edison Co.	Marysville	30,000	1927	110,000
Detroit Edison Co.	Trenton Channel	125,000	1926-7	300,000
Detroit Edison Co.	Trenton Channel	50,000	1927	
Illinois Power & Light Corp.	Danville	10,000	1927	.....
Indiana & Michigan Elec. Co.	Twin Branch	*40,000	1927	.....
Lansing, Mich.—Municipal	Lansing	21,500	1927	.....
Ohio Edison Co.	Mad River	20,000	1927	60,000
Ohio Power Co.	Philo	165,000	1928	.....
Ohio Public Service Co.	Ashland	*70,000	1927	.....
Ohio River Edison Co.	Toronto	37,500	1927	.....
Ohio River Edison Co.	Toronto	37,500	1928	.....
Public Serv. Co. of No. Illinois	Waukegan	50,000	1927	160,000
Richmond, Ind.—Municipal	Richmond	10,000	1927	.....
State Line Generating Co.	State Line	*220,000	1929	*1,000,000
Union Elec. Lt. & Pwr. Co. of Ill.	Venice	145,000	1927	350,000
Union Elec. Lt. & Pwr. Co. of Ill.	Cahokia	50,000	1927	350,000
East South Central States				
Nashville Railway & Light Co.	Nashville	*20,000	1927	.....
Southern Cities Utilities Co.	Estill Springs	†20,000	1927	20,000
West North Central States				
Central States Electric Co.	Iowa Falls	3,500	1928	.....
Empire District Electric Co.	Riverton	*30,000	1927	.....
Kansas Gas & Electric Co.	Neosho	25,000	1927	40,000
Kansas Power & Light Co.	Tecumseh	†22,500	1927	.....
Oklahoma Gas & Electric Co.	Horseshoe Lake	25,000	1928	.....
Otter Tail Power Co.	Mapleton, N. D.	4,000	....	16,000
Sioux City Gas & Electric Co.	Big Sioux	10,000	1928	.....
West South Central States				
Arkansas Utilities Co.	Helena	*4,270	1928	.....
Louisiana Power Co.	Sterlington	98,400	1927	.....
New Orleans Public Serv., Inc.	New Orleans	30,000	1927	.....
Public Service Co. of Oklahoma	Welectka	15,000	1927	45,000
Southwestern Public Serv. Co.	Amarillo	5,000	1927	50,000
Texas Electric Service Co.	Odessa	3,750	1927	5,000
Texas-Louisiana Power Co.	Alamogordo	.....	1927	.....
West Texas Utilities Co.	Spur	†800	1927	.....
West Texas Utilities Co.	San Angelo	5,000	1927	20,000
Mountain States				
Albuquerque Gas & Electric Co.	Bernalillo	3,000	1927	.....
Colorado Public Utilities Corp.	McGregor	2,750	1927	.....
Pacific States				
Los Angeles—Bureau of Power & Light	Los Angeles	*30,000	1927	.....
Pasadena, Calif.—Municipal	Pasadena	15,000	1927	.....
Southern California Edison Co.	Los Angeles	*200,000	1927	.....
Southern California Edison Co.	Long Beach	*60,000	1927	*300,000
Southern California Edison Co.	Long Beach No. 3	100,000	1928	.....

*= Kva. †= Hp.



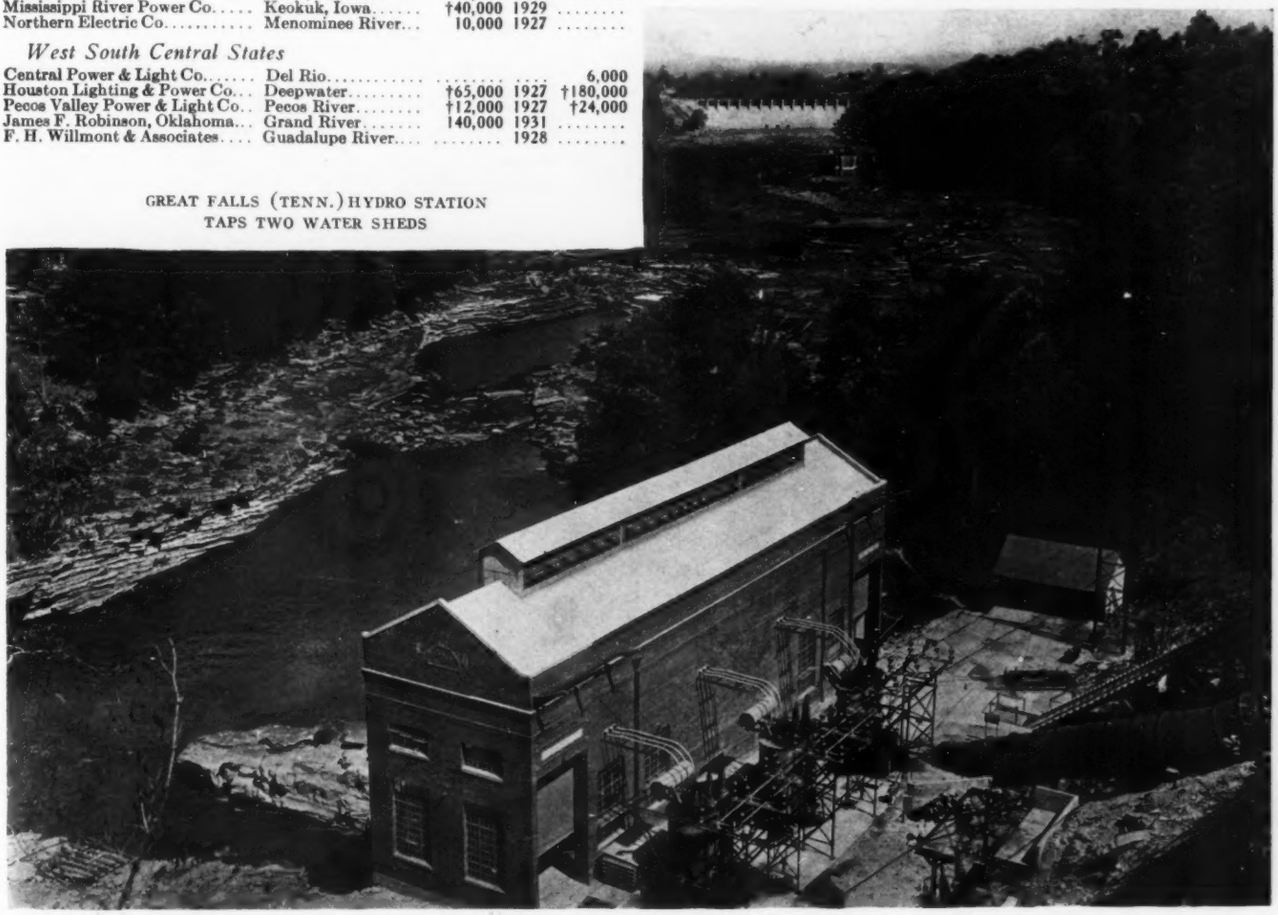
NEW YORK LEADS IN TOTAL, MONTANA IN ENERGY PER CAPITA

Energy generated in central light and power, railway, Bureau of Reclamation and other public utility plants.

Table III—Hydro-Electric Generating Plants Completed in 1927, Now Under Construction, or Planned for an Early Start, Including Additions to Existing Installations

Company	Station	Initial or Added Capacity, Hp.	Scheduled Date of Operation	Ultimate Capacity, Hp.
New England States				
Central Maine Power Co.	Gulf Island	27,000	1927	.....
Connecticut Light & Power Co.	Rocky River	32,000	1928	32,000
New England Power Association	Ridge	10,000	1927	10,000
New England Power Association	Bellows Falls, Vt.	60,000	1927	536,250
Norwich, Conn.—Municipal	Norwich	1,000	1927	.....
United Electric Light Co.	Indian Orchard, Mass.	5,000	1928	.....
Middle Atlantic States				
Northern Adirondack Power Co.	Ausable Chasm	*4,500	1927	.....
Philadelphia Electric Co.	Conowingo	350,000	1928	700,000
Rochester Gas & Electric Corp.	Genesee River	28,000	1927	60,000
Rochester Gas & Electric Corp.	Mount Morris	60,000	1927	.....
Rochester Gas & Electric Corp.	Lower Falls	20,000	1927	.....
South Atlantic States				
Carolina Power & Light Co.	Norwood	83,000	1928	245,000
Carolina Power & Light Co.	Waterville	90,000	1929	
Carolina Power & Light Co.	Swift Island	50,000	1927	100,000
Columbus Electric & Power Co.	Bartlett's Ferry, Ga.	†15,000	1928	.....
Georgia Power Co.	Burton	9,000	1927	12,000
Georgia Power Co.	Nacooche	7,000	1927	.....
Lexington Water Power Co.	Saluda River	†130,000	1930	200,000
Page Power Co.	Shenandoah River	2,000	1927	.....
Potomac River Corp.	Great Falls	†180,000	1932 = 1935	+ 225,000
Southern Power Co.	Claremont	.....	1928	56,000
Tallassee Power Co.	Badin	40,000	1927	.....
Toccoa Power Co.	Toccoa, Ga.	22,000	1929	.....
East North Central States				
Northern States Power Co.	Chippewa River	.....	1928	30,000
People's Wisconsin Hydro-Electric Co.	Namekagon River	2,000	1927	.....
East South Central States				
Alabama Power Co.	Upper Tallassee	50,000	1928	75,000
		41,500	1928	
Alabama Power Co.	Lock 18	144,000	1928	216,000
Louisville Hydro-Electric Co.	Ohio River	108,000	1927	135,000
West North Central States				
Interstate Power Co.	Delhi, Iowa	18,000	1927	.....
Mississippi River Power Co.	Keokuk, Iowa	†40,000	1929	.....
Northern Electric Co.	Menominee River	10,000	1927	.....
West South Central States				
Central Power & Light Co.	Del Rio	.....	.....	6,000
Houston Lighting & Power Co.	Deepwater	†65,000	1927	†180,000
Pecos Valley Power & Light Co.	Pecos River	†12,000	1927	†24,000
James F. Robinson, Oklahoma	Grand River	140,000	1931	.....
F. H. Willmont & Associates	Guadalupe River	.....	1928	.....
Mountain States				
Colorado Utilities Corp.	.....	10,000	1927	.....
Great Falls Power Co.	Black Eagle Falls	24,000	1927	.....
Idaho Power Co.	American Falls	†12,000	1927	.....
Inland Power & Light Co.	Clearwater River	12,000	1927	12,000
Montana Power Co.	Black Eagle Falls	25,000	1927	.....
Pacific Power & Light Co.	Lewiston	†10,000	1927	†10,000
Salt River Valley Water Users' Association	Horse Mesa	*33,000	1927	*33,000
U. S. Bureau of Reclamation	Guernsey, Wyo.	3,500	1927	.....
U. S. Bureau of Reclamation	Minidoka	*3,000	1927	*10,000
Western States Utilities Co.	Birch Creek, Idaho	275	1927	.....
Pacific States				
Aberdeen, Wash.—Municipal	Wynooche	16,000	1928	30,000
American River Wtr. & Pwr. Co.	American River No. 1	†20,000	1928	†20,000
American River Wtr. & Pwr. Co.	American River No. 2	†20,000	1928	†20,000
California-Oregon Power Co.	Prospect No. 2	44,000	1927	66,000
Cascade Power Co.	Chiwaucum	60,000	1931	73,000
Feather River Power Co.	Bucks Creek	60,000	1927	300,000
Grays Harbor Railway & Lt. Co.	Cowlitz River	60,000	1928	.....
Los Angeles, Bureau of Pwr. & Lt.	Haiwee	*7,000	1927	.....
Los Angeles, Bureau of Pwr. & Lt.	Owens River	47,000	1928	.....
Northwestern Power & Light Co.	Elwha River	17,500	1927	.....
Pacific Gas & Electric Co.	Drum	17,000	1927	.....
Pacific Gas & Electric Co.	Electra	18,000	1928	.....
Pacific Gas & Electric Co.	Melones	36,000	1927	36,000
Pacific Gas & Electric Co.	Spaulding No. 1	*8,000	1927	.....
Pacific Gas & Electric Co.	Spaulding No. 2	*3,750	1928	.....
Pacific Gas & Electric Co.	Spaulding No. 3	*7,000	1928	*7,000
Pacific Gas & Electric Co.	Tiger Creek	44,000	1928	44,000
Pacific Gas & Electric Co.	Mokelumne	60,000	1927	.....
Puget Sound Power & Light Co.	Baker River Dam	8,000	1927	.....
San Joaquin Light & Power Corp.	Kings River	40,000	1927	500,000
Seattle, Wash.—Municipal	Diablo Canyon	120,000	1928	.....
Seattle, Wash.—Municipal	Cedar Falls	†3,500	1927	.....
Shasta Power Corp.	Pitt No. 4	*100,000	1928	.....
Southern California Edison Co.	Big Creek No. 2A	112,000	1928	112,000
Tacoma, Wash.—Municipal	Cushman No. 2	50,000	1927	140,000
Turlock Irrigation District	Don Pedro	†15,000	1927	†30,000
Washington Pulp & Paper Co.	Glines Canyon	*13,333	1927	*13,333
Washington Water Power Co.	Lake Chelan	32,200	1927	128,000
Washington Water Power Co.	Lake Chelan	32,200	1928	

†=Kw. *=Kva.



GREAT FALLS (TENN.) HYDRO STATION TAPS TWO WATER SHEDS

List of Power Projects Completed in 1927 or Under Construction Under License from Federal Power Commission as of November 1, 1927.

Project No.	Name	Stream	State	Proposed Ultimate Installation, Hp.	Estimated Cost	Scheduled Date of Completion	Hp. Scheduled to Be Put in Operation or Placed in Operation 1927	1928	1929
15	Hydraulic Race Co. et al	Eighteen-Mile Cr	New York	13,240	$1,068,000	12-13-28	.....	(a) 6,965	.....
67	Southern California Edison Co	San Joaquin	California	545,000	61,152,000	7- 1-35	.....	.....	(b) 107,000
70	Rock Creek Power Co	Rock Creek	Montana	11,860	200,000	8- 1-28	.....	1,880	.....
77	Snow Mountain Water & Power Co	South Eel	California	14,400	(c) 6,665,000	7- 1-29	(c) 4,000	.....	.....
120	Southern California Edison Co	San Joaquin	California	195,000	13,890,000	12-31-29	.....	.....	(d) 90,000
137	Pacific Gas & Electric Co	No. Fk. Mokelumne	California	42,000	(e) 8,291,000	12- 1-30	.....	.....	.....
155*	Southern Sierras Power Co	Snow Creek	California	3,750	(f) 656,300	12-31-27	3,750	.....	.....
175	San Joaquin Light & Power Corp	San Joaquin	California	556,000	50,970,000	7- 1-36	38,000	.....	.....
176	Escondido Mutual Water Co	San Luis Rey	California	1,000	260,000	9- 1-26	(g) 360	.....	.....
184	El Dorado Power Co	So. Fk. American	California	(h) 112,000	8,922,319	12-31-35	.....	.....	.....
185	Southern Sierras Power Co	Lost Creek et al	California	4,000	630,000	12-31-27	4,000	.....	.....
201	Town of Petersburg	Crystal Lake	Alaska	1,240	(i) 103,500	12-31-25	.....	.....	620
233	Mount Shasta Power Corp	Pit River	California	120,000	14,924,000	12-31-31	.....	.....	.....
271	Arkansas Power & Light Co	Ouachita	Arkansas	(j) 96,000	8,055,000	7- 1-36	.....	.....	.....
289	Louisville Hydro-Electric Co	Ohio	Kentucky	135,000	7,500,000	12-31-29	.....	108,000	.....
309	Clarion River Power Co	Clarion	Pennsylvania	42,500	6,460,000	9- 1-27	(k) 20,500	.....	.....
312	Molybdenum Corp. of America	Red River	New Mexico	530	67,000	7- 1-27	.....	.....	(l) 430
338	Nevada Irrigation District	Middle Fork Yuba & Canyon Creek	California	150,000	5,100,000	7- 1-34	.....	.....	.....
353	Home Power Co	Skagway River	Alaska	250	49,000	1- 1-31	.....	.....	.....
404	Carvey, L. H	Lagoon Creek	Alaska	160	(m) 32,000	12-31-27	160	.....	.....
405	The Susquehanna Power and Philadelphia Electric Power Co.	Susquehanna	Md. and Pa.	594,000	52,200,000	12-31-35	.....	378,000	.....
432	Carolina Power & Light Co	Big Pigeon	North Carolina	139,500	11,900,000	12-31-33	.....	.....	46,500
451	Humphreys, A. E	Goose Creek	Colorado	650	157,900	11- 1-27	400	.....	.....
459	Cravens, Walter	Osage River	Missouri	135,000	14,100,000	12-31-29	.....	.....	135,000
485	Columbus Electric & Power Co	Chattahoochee	Ala. and Ga	80,000	7,500,000	12-31-26	.....	(n) 22,000	.....
516	Lexington Water Power Co	Saluda	So. Carolina	260,000	24,000,000	12-31-30	.....	.....	.....
533	Horning, Fred A	Flat Creek	Montana	80	17,900	1- 1-27	80	.....	.....
539	Kentucky Hydro Electric Co	Kentucky	Kentucky	3,000	404,000	12-31-27	3,000	.....	.....
567	East Bay Municipal Utility District	Mokelumne	California	10,000	(o) 7,922,000	12-31-31	.....	.....	.....
588	Northwestern Power & Light Co	Elwha	Washington	16,500	1,300,000	12-31-27	16,500	.....	.....
590	Snow Storm Silver Lead Co	Callahan Creek	Montana	600	60,000	1- 1-29	.....	600	.....
615	Muncy, W. G	Kelly's Gulch	California	20	(m) 4,000	1- 1-29	.....	15	.....
618	Alabama Power Co	Coosa River	Alabama	180,000	13,250,000	12-31-28	.....	72,000	.....
619	Feather River Power Co	Bucks Creek et al	California	60,000	7,700,000	6-30-28	.....	60,000	.....
621	Inland Power & Light Co	Clearwater River	Idaho	10,880	2,000,000	12-31-31	.....	5,440	.....
637	Chelan Electric Co	Chelan River	Washington	125,000	11,344,000	12-31-34	.....	25,000	.....
682	West Florida Power Co	Ochlockonee	Florida	12,000	2,100,000	8-23-29	.....	.....	12,000
693	Town of Highlands	Cullasagee	North Carolina	300	66,000	6-30-27	300	.....	.....
710	Wisconsin Power & Light Co	Wolf River	Wisconsin	920	240,000	12-31-28	.....	920	.....
714	Price and Galt	Eau Claire Creek	California	34	(m) 6,800	1- 5-30	.....	.....	34
719	Royal Development Co	James and Phelps Creek	Washington	440	105,000	12- 1-29	.....	.....	(p) 270
727	Saint Paul's Mission	Little Peoples Creek	Montana	6	(m) 1,200	1- 1-29	.....	6	.....
735	Duncan, Abe	Forni Creek	California	4	700	9-27-27	4	.....	.....
750	Galt, E. G	Eau Claire Creek	California	20	(m) 4,000	1- 5-30	.....	.....	20
787	Richel, Marion I	Black Fk. of Rock Creek	Montana	10	800	12- 1-27	10	.....	.....
807	Gorman Packing Corp	Unnamed Creek on Knight Island	Alaska	100	8,000	12-31-27	100	.....	.....
822	Gold Basis Mining & Milling Co	East Fk. of North Fk. of North Fk. of Yuba	California	270	43,000	11-30-29	.....	.....	270
Totals				3,663,284	$351,250,419		91,194	680,826	392,144

(a) 6,275 hp. previously constructed or remodeled
(b) 30,000 hp. previously installed.
(c) Cost includes about 110 miles transmission line; 10,400 hp. previously installed.
(d) 105,000 hp. previously installed.
(e) Includes 14.5 miles of transmission line.
(f) Cost includes 4.2 miles transmission line.
(g) 640 hp. previously installed.
(h) 28,000 hp. previously installed.
(i) Cost includes 16 miles of transmission line.
(j) 12,000 hp. previously installed.
(k) 22,000 hp. previously installed.
(l) 100 hp. previously installed.
(m) Assumed cost based on $200 per hp.
( ) 44,000 hp. previously installed.
(o) For power and water supply.
( ) 170 hp. previously installed.

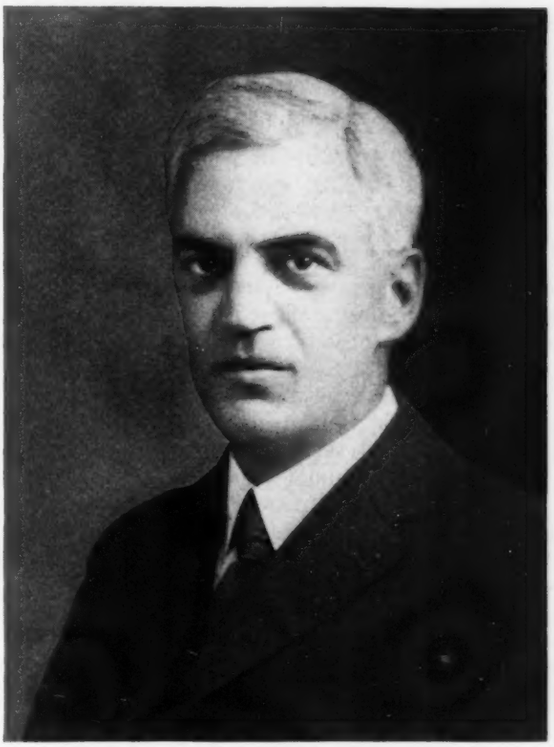
OUTDOOR COMPARTMENTS AT CHICAGO CONTAIN 12,000-VOLT BUSES AND CIRCUIT BREAKERS

What of the Future

In Producing Electrical Energy from Heat Sources

By J. C. PARKER

Vice-President Brooklyn Edison Company



J. C. PARKER

IN ATTEMPTING to forecast improvements in the cost of production of electrical energy from heat sources, a person is tempted first to think about new and weird cycles. While not discounting the opportunity for improvement in these spectacular ways, I am convinced that the big improvements in the next few years will come through more pedestrian enterprise.

Progressively the last ten years have seen stage bleeding, air preheating, economizers and intelligent uses of auxiliary steam come into their own. Water walls and preheat cycles have progressively advanced the economy of steam-power production. We don't hold our breath now when one talks of steam pressures of 1,500 lb., and evaporation at the critical point is just around the corner—reduced to practice on the continent of Europe. At Hartford the mercury cycle has shown itself to be operatively feasible and the use of diphenol oxide has alluring possibilities with all the evidence of being probably practicable.

Strangely enough, most engineering effort has been devoted to the top of the cycle with but little attention to the low temperature end except for sporadic attempts at the use of exhaust steam in certain evaporation processes. I say strangely enough, because the present lost latent heat of vaporization represents by far the biggest part of the heat taken from the boiler room. There is in my mind no question that intelligent economic research will sooner or later find a balanced process wherein this latent heat can be salvaged and our large generating plants correspondingly operated noncondensing.

Engineers who view the significant improvement in combustion brought about during the past few years must recognize that, brilliant as are the developments that have taken place, they shine only by comparison with the work of previous years. The present status of the combustion art is a long way from the ultimate. As an extreme possibility in this connection it may be pointed out that there is a sister industry which buys fuel in large quantities, prepares it for gaseous distribution and has huge quantities of solid byproducts. Clearly, from the combustion viewpoint, there should be considerable and significant possibilities of economy in the cooperative development of gas works, electric supply stations and exhaust steam utilization.

These are things to dream about, or, better, actively to study. Close at hand, however, we have the possibility of design and management improvement following our present basic methods of energy production.

The cost of energy delivered on to the bus depends on three things—investment cost, over-all efficiency and operation management. Great strides have been made with the second of these, so far as concerns the individual unit. I seriously question whether the same skill has been devoted to the development of system efficiency. Most of us, for example, consider the beautifully efficient base-load unit as a thing which has its place on the big interconnected system. What could be accomplished were the companies which operate detached from such systems definitely to design peak-load units primarily with reference to low first costs almost irrespective of operating efficiency with the idea that other units might be operated at load factors approximating 100 per cent and correspondingly designed for the maximum efficiency attainable? Could not the total cost of production significantly be lowered? We have habitually devoted most of our attention to our newer constructions with but little thought to the problem of complete utilization of our older stations as spare or emergency capacity, in spite of the fact that such treatment of the older equipment would enable at once the preponderance of generation by the more modern and efficient equipment and the saving of new construction expenditure.

In spite of the appearance that engineers and operators display when on dress parade, the substantial fact is that we are woefully ignorant of the things that we can do operatively with our equipment, once installed. For example, to obtain a high system economy it is absolutely essential that the least economical equipment be held available for emergency purposes only, yet there is absolutely no quantitative knowledge in the industry or fundamental understanding even of the sequence of events ensuing on the sudden throwing of load on to such stand-by equipment. Operating management is then necessarily curtailed in most fully realizing the best that can be had from the equipment installed. A fraction of

Total Energy and Fuel-Generated Energy in Public Utility Plants in the U. S. 1919-1927

Including electric light and power, electric railway, Bureau of Reclamation and certain other plants generating energy for public consumption:

Year	Kw.-Hr. Generated in all Public Utility Plants (Millions)	Kw.-Hr. Generated from Fuel (Millions)	Coal Consumed (Thousands of Tons)	Coal Equivalent of all Fuel† (Thousands of Tons) Total	Pounds of Coal per Kw.-Hr.
1919	38,921	24,176	35.10	38.88	3.2
1920	43,555	27,248	37.13	41.43	3.0
1921	40,976	25,863	31.59	35.25	2.7
1922	47,659	30,240	34.18	38.01	2.5
1923	55,674	36,092	38.96	43.53	2.4
1924	59,014	38,808	37.56	43.14	2.2
1925	65,870	43,264	40.23	44.79	2.1
1926	73,791	47,274	41.32	45.87	1.95
1927	79,588*	50,141*	41.75*	46.22*	1.84*

*Estimate based on ten months' operations.
†Includes oil and natural gas.

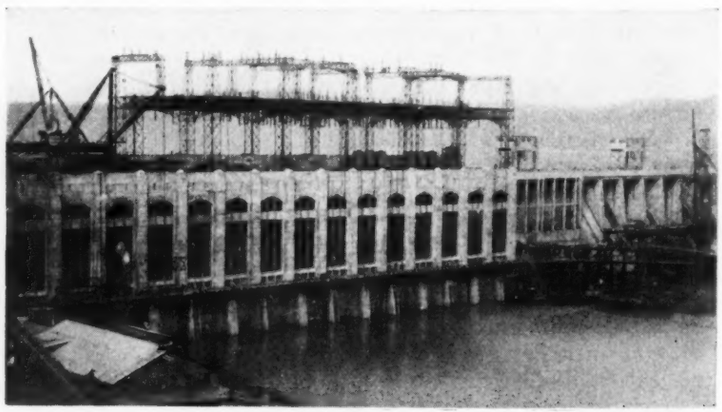
the effort which has gone into design development if devoted to operating management research would produce most significant improvements in the steam-generating art.

Granted the most advanced cycle, system design for high efficiency and fundamentally sound operating management, there still remains room for improvement in capital costs. We cannot expect any enormous reductions in the first cost of our turbine equipment or in the boiler equipment per unit of capacity. However, we are learning to use the installed boiler room capacity for duties which a few years ago would have been undreamed. Only yesterday one heard of a boiler being operated at 700 per cent of nominal rating, and the question naturally arises as to when we will throw nominal ratings overboard entirely. Such developments as the result of water-cooled walls and powdered fuel are in the spectacular class, but there is even more significant improvement of capital cost to be had in the detail layout.

Designers have exercised a fiendish ingenuity in pyramiding valves and piping systems, switches and relays and academically exquisite schemes to obtain efficiencies which no routine operation ever could attain because the technical complications have jeopardized reliability.

All great art has distinguished itself through simplicity and straightforwardness of conception and boldness of execution. Admirable as have been the engineering advances in power plant design, it is questionable whether they have been distinguished in this sense. Complication of design not only causes excessive initial cost, but demands labor crews and supervisory effort that may easily be way out of proportion to the paper gains expected. In his entire professional career the writer has never yet discovered that thoughtful simplification did not result in greater dependability and higher economy of operation.

In attempting to predict the immediate future of the steam-generating art, one would be bold, if not foolish, to attempt to say which element will produce signal improvements and to what extent. Could that be done to any degree of certainty, the future would already have become present. However, it is hoped that the foregoing may indicate that the production of electrical energy from the heat of combustion has not attained anything approaching full development but rather that the ensuing few years will produce not only more kilowatt-hours per pound of fuel but even more significantly more kilowatt-hours per dollar expended. The unique attainment of the electrical industry—pushing down the price of its commodity in the face of increased costs for all other elements in living—is going to continue almost without limit into the future.

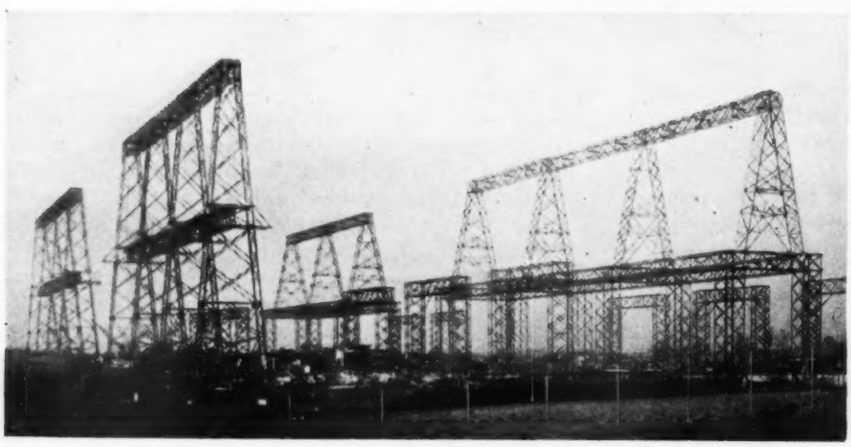


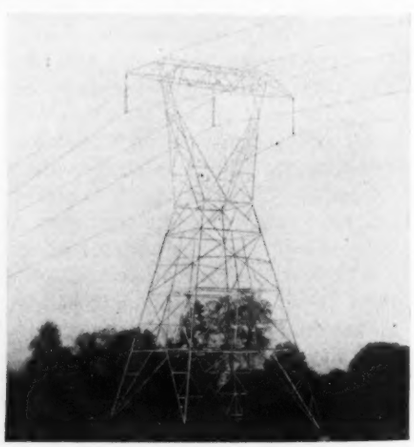
Conowingo Interconnection

Right—The 400,000-kw. Conowingo hydro station of the Philadelphia Electric Company.

Below—Plymouth Meeting substation will interconnect 220-kv. lines of the Pennsylvania Power & Light Company, Public Service Electric & Gas Company and Philadelphia Electric Company.

Lower Right—Two lines of these towers carry 220-kv. circuits from Conowingo to Philadelphia.





21,694,000 Customers

More than 1,500,000 added in 1927. Residential customers increase by 1,237,000 to nearly 17,600,000. 63 per cent of American homes now served. Rate of growth 7.5 per cent. Peak of increase has been passed

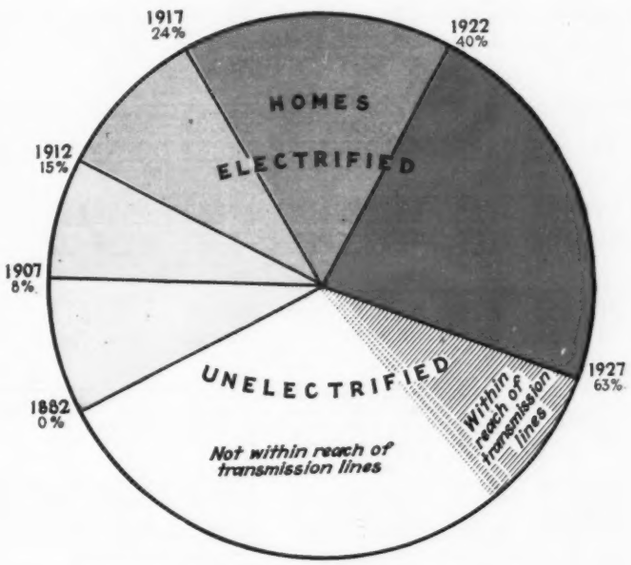
THE beginning of 1928 finds the electric light and power industry serving 21,694,100 customers, classified into 17,596,400 residential, 3,166,570 commercial and 931,140 industrial power users and others. The last-named group includes some miscellaneous customers not listed by companies reporting under any one of the three major classes, but their number is relatively small.

The net increase during the year 1927 is estimated at 1,515,569, divided into 1,237,111 residential, 203,160 commercial lighting and 75,298 others. The rate of increase was approximately 7.5 per cent; slightly lower if all classes are considered together; a trifle higher for domestic customers alone.

Although individual companies reported gains far in excess of the national average, the greatest regional gains, both numerically and in per cent, occurred in the Middle Atlantic group of states; the rate of growth in that section was 9.4 per cent, rising to nearly 10 per cent in New York and somewhat higher in New Jersey. As in previous years, the influence of the metropolitan area is marked.

The returns for 1927 corroborate the inference drawn from similar statistics in recent years: the period of maximum increase in number of customers has been passed; growth from now on will probably be more and more gradual. Residential customers constitute by far the largest group numerically—about four-fifths of the total—and since the number of those using electricity is approaching two-thirds of all the homes in the country, it is reasonable to suppose that the rapid increase observed a few years ago could not long continue.

It might be urged that the data are not entirely homogeneous; customers, consumers, number of meters and number of open accounts are variously reported when an effort is made to ascertain the number of light and power customers. These terms are not equivalent, but the data thus gathered are the best to be had at this time; while the differences would no doubt preclude a fair comparison of the operations of certain individual companies, the effect on state and national totals is not great. Some of the errors tend to balance out, and the resulting figures represent the number of families, of business places and of power-consuming establishments with reasonable accuracy for practical purposes.



SIXTY-THREE PER CENT OF HOMES ARE ELECTRIFIED.
23 PER CENT SINCE 1922

The table of customers on page 66 has been critically revised, in the light of all available sources of information. It embodies the results of special surveys, of data collected throughout the year and of much correspondence with all authorities in the various states from whom authentic data might be had.

Assuming, then, that a residential customer is substantially equivalent to a family electrically served, and basing the estimated number of families on census statistics for the year in question, it appears that nearly 64 per cent of our national population now have central-station service in their homes. This excludes isolated plants not classed as public utilities, in particular farm-lighting sets which are estimated at 350,000.

In the past the net increase in customers has far outrun the growth in population. The turning point appears to have been reached in 1924; the gain that year was about 2,000,000 customers of all kinds. In the next three years it was successively, in round numbers, 1,700,000, 1,700,000 and 1,500,000. The residential growth presents the same picture, only the figures are a little smaller — namely, 1,600,000, 13,500,000, 13,500,000 and 12,400,000, respectively, again in round numbers.

The accompanying table summarizes the changes that have taken place in twenty years. The electrical industry was by no means insignificant in 1907, but in retrospect the figures of that day look small. In two decades the increase in customers has been more than tenfold. The number has trebled in a decade.

Data for the earlier years are reprinted from the United States Census of Central Electric Light and Power Stations. Those subsequent to 1922 have been critically revised in the light of the best available information. In addition to statistics received directly through the cooperation of the companies themselves, generous assist-

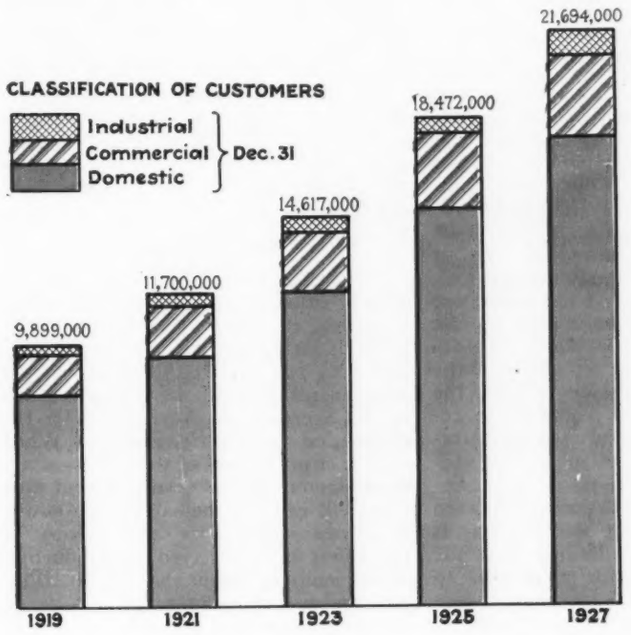
(Central Station Customers by States (1907-1927) and Classes (1926-1927)

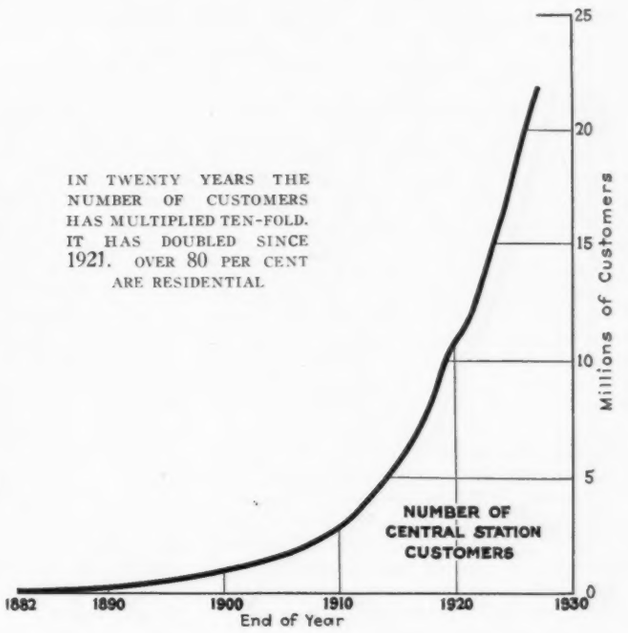
	U. S. Central Station Census				1924	1925	1926	1927	Increase During 1927	Domestic Lighting Customers			Commercial Lighting Customers			Power and Miscellaneous Customers		
	1907	1912	1917	1922						1926	1927	Increase During 1927	1926	1927	Increase During 1927	1926	1927	Increase During 1927
United States	1,946,979	3,837,518	7,178,703	12,709,868	16,768,509	18,472,146	20,178,531	21,694,100	1,515,569	16,359,279	17,596,390	1,237,111	2,963,410	3,166,570	203,160	855,842	931,140	75,298
New England	162,875	313,227	647,289	1,143,697	1,525,125	1,689,255	1,804,276	1,931,210	126,934	1,472,896	1,585,800	112,904	260,010	269,270	9,260	71,370	76,140	4,770
Middle Atlantic	419,837	822,906	1,523,862	3,242,775	4,260,962	4,814,550	5,392,703	5,952,800	560,097	4,304,103	4,764,700	460,597	909,000	987,600	78,600	179,600	200,500	20,900
South Atlantic	93,471	193,909	357,577	679,081	1,072,467	1,198,211	1,349,844	1,454,500	104,656	1,081,125	1,168,830	87,705	211,410	222,980	11,570	57,309	62,690	5,381
East North Central	485,534	940,883	1,884,042	3,311,010	4,316,179	4,682,661	5,106,361	5,418,400	312,039	4,249,038	4,515,040	266,002	668,700	702,490	33,790	188,623	200,870	12,247
West North Central	236,622	451,386	988,104	1,560,698	1,913,965	1,995,822	2,113,050	2,222,050	109,000	1,709,300	1,798,350	89,050	303,800	318,100	14,300	99,950	105,600	5,650
East South Central	70,798	107,106	184,126	351,899	529,545	552,987	615,300	671,300	56,000	488,300	530,450	42,150	104,300	115,600	11,300	22,700	25,250	2,550
West South Central	117,055	223,283	373,180	605,331	930,217	1,015,162	1,082,200	1,167,900	85,700	826,300	880,250	53,950	198,050	225,150	27,100	57,850	62,500	4,650
Mountain	107,831	182,108	337,087	445,270	522,028	544,572	585,697	611,740	26,043	485,817	506,390	20,573	77,070	81,090	4,020	22,810	24,260	1,450
Pacific	252,956	491,730	791,276	1,357,372	1,698,021	1,978,926	2,129,100	2,264,200	135,100	1,742,400	1,846,580	104,180	231,070	244,290	13,220	155,650	173,330	17,700
New England:																		
Maine	19,614	28,511	51,213	92,733	137,018	150,418	(a) 158,278	166,400	8,122	123,278	129,500	6,222	26,300	27,600	1,300	8,700	9,300	600
New Hampshire	14,082	22,752	38,280	64,158	(a) 89,055	(a) 96,147	(b) 102,400	113,500	11,100	80,800	89,700	8,900	17,550	19,300	1,750	4,050	4,500	450
Vermont	15,361	22,380	33,147	48,320	57,570	62,220	68,820	72,610	3,790	57,430	59,500	2,070	8,080	8,220	140	3,310	4,890	1,580
Massachusetts	80,713	163,993	344,437	607,563	(a) 812,058	(a) 906,606	(a) 960,148	1,031,400	71,252	784,648	851,200	66,552	137,200	140,000	2,800	38,300	40,200	1,900
Rhode Island	11,591	19,088	43,817	86,271	120,074	130,889	144,730	155,350	10,620	120,540	130,100	9,560	20,180	21,050	870	4,010	4,200	190
Connecticut	21,514	56,503	136,395	244,652	(a) 309,341	342,975	(a) 369,900	391,950	22,050	306,200	325,800	19,600	50,700	53,100	2,400	13,000	13,050	50
Middle Atlantic:																		
New York	201,701	434,110	794,516	1,760,418	(a) 2,296,482	2,548,833	(a) 2,915,073	3,234,800	319,727	2,297,173	2,549,900	252,727	529,000	584,000	55,000	88,900	100,900	12,000
New Jersey	57,179	105,785	202,030	428,934	(a) 644,112	749,347	(a) 854,100	953,500	99,400	697,700	777,300	79,600	122,000	134,500	12,500	34,400	41,700	7,300
Pennsylvania	160,957	283,011	527,316	1,053,423	(a) 1,320,368	1,516,370	1,623,530	1,764,500	140,970	1,309,230	1,437,500	128,270	258,000	269,100	11,100	56,300	57,900	1,600
South Atlantic:																		
Delaware	*11,165				21,112	28,750	31,900	33,600	1,700	25,100	26,430	1,330	5,900	6,210	310	900	960	60
Maryland	22,168	†66,465	†108,178	†209,947	(a) 191,181	(a) 220,104	(a) 250,791	274,500	23,709	215,500	236,400	20,900	30,900	33,250	2,350	4,391	4,850	459
Dist. of Columbia					(a) 77,057	(a) 91,179	(a) 107,375	119,800	12,425	86,575	97,700	11,125	15,700	16,600	900	5,100	5,500	400
Virginia	6,969	14,948	35,705	61,182	134,965	153,455	(a) 182,450	199,900	17,450	152,700	167,200	14,500	19,800	21,800	2,000	9,950	10,900	950
West Virginia	9,404	18,165	32,520	74,069	(a) 118,553	(a) 131,088	(b) 141,528	152,500	10,972	111,200	121,000	9,800	25,300	26,400	1,100	5,028	5,100	72
North Carolina	9,719	25,676	51,603	106,392	164,439	180,059	(b) 195,600	209,500	13,900	149,400	161,100	11,700	37,780	38,900	1,120	8,420	9,500	1,080
South Carolina	8,054	17,602	32,226	61,685	94,291	98,641	(b) 106,000	114,200	8,200	83,250	89,700	6,450	19,330	20,820	1,490	3,420	3,680	260
Georgia	15,452	29,109	47,235	73,957	127,193	138,135	154,200	168,700	14,500	123,900	135,600	11,700	24,200	26,400	2,200	6,100	6,700	600
Florida	10,540	21,944	50,110	91,849	143,676	156,800	180,000	181,800	1,800	133,500	133,700	200	32,500	32,600	100	14,000	15,500	1,500
East North Central:																		
Ohio	100,071	174,467	353,183	774,605	(d) 1,096,793	(d) 1,205,844	( ) 1,365,000	1,447,000	82,000	1,152,000	1,228,000	76,000	174,000	177,000	3,000	39,000	42,000	3,000
Indiana	86,237	156,603	267,628	405,240	502,351	538,571	( ) 579,300	611,200	31,900	490,000	515,600	25,600	69,400	74,000	4,600	19,900	21,600	1,700
Illinois	167,645	364,046	682,260	1,127,830	1,457,261	1,565,473	(b) 1,683,800	1,779,000	95,200	1,393,100	1,470,740	77,640	223,500	237,290	13,790	67,200	70,970	3,770
Michigan	87,500	187,545	421,692	659,233	850,140	909,841	(b) 955,000	1,016,300	61,300	803,400	856,800	53,400	126,200	132,800	6,600	25,400	26,700	1,300
Wisconsin	44,081	90,242	194,402	345,241	(a) 409,634	(a) 462,932	(b) 523,261	564,900	41,639	410,538	443,900	33,362	75,600	81,400	5,800	37,123	39,600	2,477
West North Central																		
Minnesota	54,214	104,504	219,045	342,171	409,212	429,262	450,400	476,300	25,900	363,700	384,750	21,050	67,800	71,750	3,950	18,900	19,800	900
Iowa	48,516	90,299	198,119	298,911	355,535	366,965	386,900	407,000	20,100	310,500	328,200	17,700	54,000	55,500	1,500	22,400	23,300	900
Missouri	61,575	143,997	276,463	410,650	563,715	(c) 597,813	645,800	676,500	30,700	517,700	541,500	23,800	101,000	105,700	4,700	27,100	29,300	2,200
North Dakota	7,999	15,618	35,378	47,047	53,920	54,547	56,600	59,400	2,800	44,100	46,400	2,300	10,200	10,600	400	2,300	2,400	100
South Dakota	7,940	20,391	42,184	60,254	64,206	64,625	66,350	69,150	2,800	51,700	53,900	2,200	10,800	11,250	450	3,850	4,000	150
Nebraska	27,086	61,814	116,970	165,976	183,450	186,770	195,600	206,600	11,000	160,000	169,000	9,000	27,400	28,900	1,500	8,200	8,700	500
Kansas	29,292	68,396	137,018	236,202	283,927	295,840	311,400	327,100	15,700	261,600	274,600	13,000	32,600	34,400	1,800	17,200	18,100	900
East South Central:																		
Kentucky	24,282	51,204	91,738	149,682	191,998	200,510	212,100	230,700	18,600	167,900	181,300	13,400	35,100	39,200	4,100	9,100	10,200	1,100
Tennessee	16,426	35,326	52,078	114,534	167,050	180,704	192,000	206,900	14,990	153,300	164,100	10,800	31,300	34,700	3,400	7,400	8,100	700
Alabama	16,261	23,890	34,669	54,549	103,149	131,450	150,900	168,400	17,500	119,800	133,900	14,100	27,400	30,300	2,900	3,700	4,200	500
Mississippi	13,829	22,013	25,605	44,217	55,158	56,830	60,300	65,300	5,000	47,300	51,150	3,850	10,500	11,400	900	2,500	2,750	250
West South Central																		
Arkansas	12,071	20,500	42,449	56,096	100,696	111,697	120,800	131,200	10,400	98,500	107,100	8,600	18,700	20,100	1,400	3,600	4,000	400
Louisiana	15,972	27,838	47,536	58,901	117,669	127,210	131,400	136,100	4,700	101,000	104,300	3,300	24,900	25,950	1,050	5,500	5,850	350
Oklahoma	20,565	46,860	88,047	154,669	191,884	199,755	(b) 213,100	232,800	19,700	165,100	176,950	11,850	36,250	41,400	5,150	11,750	14,450	2,700
Texas	68,447	128,085	195,148	335,665	519,968	576,500	616,900	667,800	50,900	461,700	491,900	30,200	118,200	137,700	19,500	37,000	38,200	1,200
Mountain:																		
Montana	17,630	32,312	59,176	62,646	75,988	78,522	(a) 80,880	84,670	3,790	64,200	67,120	2,920	12,900	13,400	500	3,780	4,150	370
Idaho	12,656				69,700	72,690	77,300	79,900	2,600	61,360	63,500	2,140	13,590	13,950	360	2,350	2,450	100
Wyoming	5,116	8,437	19,590	25,395	31,848	32,040	33,600	35,240	1,640	28,800	30,200	1,400	3,400	3,570	170	1,400	1,470	70
Colorado	46,911	68,046	92,242	132,708	175,218	182,820	194,700	204,500	9,800	161,700	169,000	7,300	24,350	26,250	1,900	8,650	9,250	600
New Mexico	4,494	8,551	13,988	18,834	22,780	24,050	25,700	27,050	1,350	21,400	22,540	1,140	3,250	3,410	160	1,050	1,100	50
Arizona	5,854	12,668	24,320	38,552	40,059	40,348	41,900	43,480	1,580	34,400	35,700	1,300	5,460	5,660	200	2,040	2,120	80
Utah	11,212	‡45,965	‡116,276	‡156,127	100,910	109,320	(b) 114,700	119,300	4,600	100,800	104,600	3,800	10,800	11,450	650	3,100	3,250	150
Nevada	3,958	6,129	11,495	11,008	13,042	(a) 13,179	(a) 16,917	17,600	683	13,157	13,730	573	3,320	3,400	80	440	470	30
Pacific:																		
Washington	46,452	73,421	115,488	260,610	331,321	365,221	(b) 366,400	382,700	16,300	316,200	330,080	13,880	41,120	42,790	1,670	9,080	9,830	750
Oregon	33,475	33,627	55,985	78,534	(b) 178,112	(b) 182,664	197,900	209,400	11,500	170,200	180,600	10,400	18,950	19,650	700	8,750	9,150	400
California	173,029	384,682	619,803	1,018,228	(b) 1,188,588	(b) 1,431,041	(b) 1,564,800	1,672,100	107,300	1,256,000	1,335,900	79,900	171,000	181,850	10,850	137,800	154,350	16,550

*Includes District of Columbia. †Includes Delaware and District of Columbia. ‡Includes Idaho. (a) State Utility Commission figures. (b) Based on Utility Commission report, part estimated.
(c) Figures from report of Committee on Public Utility Information. (d) Based on figures from report of Committee on Public Utility Information.

ance has been rendered by the public utility commissions of many of the states and by committees on public utility information. Credit for new figures is indicated in the table. Where official figures were obtainable, they have been substituted for the ELECTRICAL WORLD estimates previously published, except where they were known to be incomplete. A number of state commissions were able to give data for private companies, but had no jurisdiction over municipal operations, so that data had to be combined.

In most instances the changes thus introduced were surprisingly small. The net result was an upward revision of about 2 per cent, evidence of the successful operation of the policy of estimating as accurately as possible, but of leaning toward the conservative side wherever judgment had to be exercised in interpreting data. The diminishing margin between the number of potential and of actual customers, particularly in the residential field, shows the growing need of developing greater use per customer, if growth is to continue.





Water Power of the World

THE DEVELOPED water power of the world, according to estimates made by the United States Department of the Interior through the Geological Survey, was about 33,000,000 hp. at the end of 1926, an increase of 43 per cent in six years. It was 23,000,000 hp. in 1920 and 29,000,000 hp. at the end of 1923. About three-fourths of the increase for the last three years has been in the English-speaking section of North America. Europe made a brief spurt during and after the World War but has now slowed down appreciably in its construction of hydro-electric power plants.

It is difficult to co-ordinate estimates of water power for the several countries, particularly estimates of potential water power, because of differences in their elements and character and in the completeness and accuracy of the data on which they are based; but the estimates here given are considered sufficiently accurate to afford a rough idea of the potential water-power resources of the world and the extent of their development. The figures for the developed water power represent the rated capacity of water wheels or turbines installed, and the figures for the potential power represent the total power that could be obtained at ordinary low water, including the power already developed. The installed capacity usually amounts to from two or three times the power available at low water.

In the accompanying tables the potential power for the United States represents the power available 90 per cent of the time at 70 per cent efficiency.

TABLE I—SUMMARY OF POTENTIAL AND DEVELOPED WATER POWER IN NORTH AMERICA BY COUNTRIES (1926)

Country	Horsepower	
	Developed	Potential
Mexico	300,000	6,000,000
United States	11,721,000	35,000,000
Alaska	43,000	1,000,000
Newfoundland	160,000	400,000
Canada	4,556,000	18,250,000
Costa Rica	15,000	1,000,000
Guatemala	4,000	1,500,000
Honduras	3,000	1,000,000
Nicaragua	400	800,000
Salvador	2,700	200,000
Panama	13,300	500,000
West India	19,350	150,000
Total	16,837,750	65,800,000

TABLE II—WATER POWER RESOURCES OF CONTINENTS

	Developed Hp.	Potential Hp.
North America	16,800,000	66,000,000
South America	750,000	54,000,000
Europe	13,100,000	58,000,000
Asia	2,100,000	69,000,000
Africa	14,000	190,000,000
Oceanica	240,000	17,000,000
Total	33,004,000	454,000,000

*Includes Delaware and District of Columbia.
†Includes Idaho.
‡Includes District of Columbia.
(a) State Utility Commission figures.
(b) Based on Utility Commission report, part estimated.
(c) Figures from report of Committee on Public Utility Information.
(d) Based on figures from report of Committee on Public Utility Information.

News of the Industry

State Commissions to Oppose Walsh

Their Representatives Expected to Object to Federal Investigation of Companies Regulated by Them—How Muscle Shoals Bills Shape Up

By Paul Wooton
Washington Correspondent of the Electrical World

BEFORE considering the action it will take on the Walsh resolution, which proposes a minute inquiry by a special committee of the Senate into virtually every phase of the public utility business, the committee on interstate commerce, as already reported, plans to hold public hearings, to begin Jan. 16. Apparently it will be developed at these hearings that the state public service commissions will not be in accord with the Walsh proposal. The feeling among the state utility commissions, it was stated at the headquarters of their association in Washington, is that there is no need for additional regulative machinery. They look upon the utilities as essentially local enterprises. To have the federal government concerning itself with electric power and gas, of which only a small proportion of the total moves interstate, seems to them an instance of the tail wagging the dog.

At the hearing it is expected that witnesses representing the state commissions will emphasize the position that the matter is one of state rather than federal concern. It will be pointed out that the utilities, including the holding companies and their earnings and securities, are subject to the plenary power of the states, which is being exercised effectively. It will be emphasized that the states have not sought the proposed investigation and that no reason exists for the transfer to Washington of complaints which in the usual course would be taken up by the state commissions. It is expected also that some of the executives and other officers of the power companies will answer Senator Walsh's charge of overcapitalization of the industry and exorbitant rates to consumers.

One of the points which will be brought out at the hearing is the almost unlimited scope of the proposed investigation. It would include banks, insurance companies, educational institutions and other concerns affiliated with companies owning public utility stocks. Engineering and construction companies, as well as financial concerns, are specifically included in the resolution, as are non-utility companies that have even remote connections with a utility.

While the committee has taken no action on the resolution so far other than to fix a time for its consideration and the probable beginning of hearings, there is no disposition on the part of any members, so far as is known, to delay a report to the Senate beyond the time necessary for proper consideration of the resolution. Under the procedure the committee may report the resolution favorably or unfavorably, or may report it recommending its passage in an amended form. If the committee should accept the view taken by the representatives of the state commissioners as indicated at the offices of the association of commissioners here, the tendency undoubtedly would be to restrict the proposed inquiry to the interstate business engaged in by the utilities.

One of the principal points expected to be brought out at the hearing is that the state commissions and the courts, in dealing with valuations to be made the basis of rate fixing, pay no attention whatever to the amount of capitalization of the companies or the outstanding securities. It is expected that the representatives of the power companies will categorically deny the charge of overcapitalization and will present figures sustaining their denial. At the same time it will probably be shown that the question of overcapitalization is one which affects investors rather than consumers of power, inasmuch as the commissions and the courts nowadays totally disregard such questions in fixing rates.

Judging from the language of the Walsh resolution its proponents are not willing to accept the determinations of the state authorities. This is a factor in the proposed investigation that is sure to claim the attention of the leaders of an administration pledged to economy. The cost of checking the underlying data of capital issues aggregating $9,500,000,000, of evaluating the even larger and more intricate property accounts, to say nothing of the analysis of the corporate structure of more than a hundred holding companies, would be great. In view of all of this it is not thought likely that the committee will approve the resolution in its present form.

The fact that the Potomac Electric Power Company has reduced its rates 41 per cent in the last three years in the city which is the residence of national legislators during the sessions of Congress should have an important bearing on the proposed investigation of the electric industry, officials of the Potomac company think. They feel that the conduct of the electric utility in the national capital has been of such a character as to create a good impression among members of Congress, and it is pointed out that the household rate in Washington is among the lowest in the country and is lower than that in Buffalo, where hydro-electric power is available. The low rates prevailing in Washington are in spite of the stringent local regulations, which require the almost exclusive use of underground conduits.

Three Muscle Shoals Bills

To bring up to date the Muscle Shoals situation as it presents itself to Congress, it may be still of interest to make it clear that a bill is being prepared to put into legislative form the recommendations of the President and of the Secretary of Agriculture for the disposition of Muscle Shoals. While the exact provisions of the bill have not been announced, it is understood that they will call for the sale of the power at a reasonable price and the use of the funds thus received in conducting experiments in the production, distribution and use of concentrated fertilizers.

Two propositions are now pending in Congress. One, by Senator Norris, is before the Senate committee on agriculture. It is essentially a government operation and ownership plan both with respect to fertilizer production and generation, distribution and sales of power. It authorizes appropriations for additional power equipment that would cost perhaps $15,000,000. Pending before the military committee of the House is a bill by Congressman Madden authorizing the execution of a contract with the American Cyanamid Company for a fifty-year lease of the Muscle Shoals properties on condition that the United States expend an additional sixty-five or seventy million dollars for building two additional power plants, one at dam site No. 3 and the other at the Cove Creek site near Knoxville, Tenn. The contract proposes that the lessee shall engage in fertilizer production on various stipulated conditions. Mr. Madden has just issued a statement calling attention to the fact that no less than 63 "improvements" have been incorporated in the bill by agreement between the committee and the American Cyanamid Company and declaring: "As the legislation is now drawn it is my judgment that it represents a most effective instrument for securing to the country those benefits to national defense and agriculture which we sought to secure when we passed the national defense act in 1916."

Each of these measures—the Norris bill and the Madden bill—will provoke strong opposition in both houses.

Governor Smith Reiterates Power Views

But Suggests that His Desired Power Authority Prove the Economic Soundness of Its Plan Before Legislative Sanction Is Given

GOVERNOR SMITH in his eighth annual message to the New York State Legislature, submitted on Wednesday of this week, renews his request for the establishment of a New York State Power Authority, but he has again shifted his position somewhat in that he suggests that such authority when created prepare a comprehensive plan dealing with the production and distribution of hydro-electric energy which before any development would be undertaken would be written into the statutes by the Legislature in the same manner that a comprehensive plan for the development of the port of New York was enacted in detail in the law giving that body power to function.

In respect to power development the message says in part:

In 1921 the Legislature saw no obstacle to the setting up of the Port of New York Authority, and to the approval of a comprehensive plan for the development of that port which, when carried into effect, will cost upward of three hundred million dollars. Even more recently the Legislature did not oppose amending that plan and conferring upon the Port Authority the power to issue its bonds for the construction of bridges between New York and New Jersey, to cost more than one hundred million dollars. All of the bonds sold for the progress of this great public work have been offered to the public upon the basis of the ability of these improvements to earn interest and sinking fund charges.

What is the difference between a joint undertaking like the development of the Port of New York and the construction of these bridges and the development of water power at sites now in possession of the people of the state? I see none. In fact, I am convinced that the economic worth of such development can be as easily demonstrated to prospective bondholders as can the economic worth of the developments at the Port of New York. Moreover, I have such confidence in this method of financing that I believe that unless and until such economic proof is forthcoming, no move should be made by any authority set up by the state to offer its bonds to the public.

Following, therefore, the charted path and taking a lesson from actual experience, why should we not set up in this state a New York State Power Authority which would be a public corporation, municipal in character, having no stockholders, deriving its powers from the state and having duties specifically imposed upon it to take over and develop the power resources of the state? Such a corporation should be given the power to issue bonds exempt from state taxation and secured by the revenues to be derived from the improvements when made.

The Power Authority should be directed in the first instance to prepare a comprehensive plan for the development of our water-power resources and submit it, with the economic proof of its soundness, to the Legislature just as the Port Authority submitted its proposals to develop the Port of New York. . . . Should it develop that they were unable to prove the economic soundness of any plan they may propose, it will remain within the power of the Legislature to reject the plan and the question will be definitely settled for all time. But, before the fact is established, to alienate the resources, to lease them to private control for a lifetime, would be a deliberate and willful waste of a great God-given resource that should be developed in the interest of the people.

The question of water-power development at the present time is receiving nation-wide attention. Giant power combines naturally will stand against the proposal of a public authority, but it is difficult to be in sympathy with their viewpoint because it is purely selfish. On the other hand, there is today an insistent and growing demand for the development of these power resources by the rightful owners—the public themselves. . . .

There is one sure way to get the full benefit of hydro-electric energy for the small storekeeper, the small home-owner and the people on the farm, and that is to have the state retain the ownership not only of the source of the power but of the development works. The comprehensive plan prepared by the Power Authority can deal with the distribution after study and research. It will have to be a part of the plan, which in turn will have to receive legislative approval before it can be effective. No harm can come to the state by a trial along the same lines already adopted for other great public developments by means of such an authority. Nobody can honestly and conscientiously oppose it unless they belong to that reactionary Bourbon group who are against public ownership or public development of any resource.

After referring to the two state-owned hydro-electric plants on the Barge Canal, the Governor concludes:

There are but two roads upon which we can travel. There is no middle course. We must either take a chance and lease these properties for a term of years, which really means giving them away with the possible right of recapture after we are all dead and gone, with all the consequent litigation attendant thereon, or declare for ourselves at once, retaining not only our full and complete ownership of these properties but the right to make contracts at rates favorable to the real owners of the power—the people of the state.

Public Utility Regulation

Upon the subject of public utilities the message repeats recommendations of former years, saying:

All along I have stood for the right of a locality to regulate a public utility operating wholly within its borders upon the theory that the service is being rendered to the people of a single city and the elected officials of the city are held responsible in the first instance. The people look to them and not to the state. Further, local officials have been prone to blame the state when service and rates are not what the people believe they should be.

There is also no reason why the state should not delegate its police power for the regulation of public utilities to the properly elected officials of a municipality. There are many cities in the state which may not desire that power. In order not to infringe upon their home-rule prerogatives, it might be well to frame a statute in such a form that it would require the municipality to take an affirmative stand and by resolution of its local common council seek permission to exercise the state's authority over public utility corporations entirely within its corporate limits. In the absence of a specific request, the control should remain with the state.

New York State Mayors Ask for State Hydro Power

The New York State Conference of Mayors, sometimes called the "third house" of the Legislature, meeting last week, recommended that the Legislature provide for the state development of undeveloped hydro-electric power. It will supplement the Governor's message by sending to the Legislature its recommendations. Regarding utility legislation, the conference says:

"We urge the Legislature to enact legislation of a permissive character which will give to the municipalities the right to acquire, construct, own, lease and operate within or without their corporate limits any public utility, product or service which is or is to be supplied to the municipality or its inhabitants, or to enter into contract for such product or service."

High Bridge Plant at St. Paul Meets with Accident

Referring to press reports of an explosion in the plant of the Northern States Power Company in St. Paul on the afternoon of Jan. 3, Robert F. Pack, vice-president and general manager, made the following statement:

"Shortly before 3 o'clock in the afternoon of Jan. 3 there was a flashover in generator No. 2 at the High Bridge station, putting this unit out of commission. With the exception of very minor injury to two employees, no persons were injured and no damage was done to any property other than the company's. The plant was slightly damaged by fire, and there was an interruption in some sections of St. Paul for approximately half an hour. Speedy resumption of the service was made possible owing to the interconnection of different plants of the Northern States Power system into the power loop that surrounds the Twin Cities. There is ample generating capacity to supply all requirements until repairs to the damaged generator can be made."

Central Maine Power Reports Excellent Outlook

Further expansion of the Central Maine Power Company system is now under way after the best year in the history of this utility. In a statement made on Jan. 1 President Walter S. Wyman said that work has begun on the 5,500-hp. hydro-electric station to be built on the Androscoggin River at Deer Rips. It is expected that the new Deer Rips plant will be completed next fall.

During 1926 the company supplied service to more than 600 additional rural homes and also established a new sched-

ule of rates in several districts which will save its customers substantial amounts. Work is being pushed at top speed in the construction of a 110-kv. line, the first in the state, from Lewiston to Windsor and from Rockport to Thomaston, principally for supplying power to a new cement plant in the latter town. Mr. Wyman says that the chief regret of 1927 is that favorable action upon the exportation of surplus power from the state was withheld by the Legislature.

Purchases and Mergers

H. C. Orton of Interstate Power Explains Further the Coming Transfer of Federal Public Utilities to Utilities Power & Light

PLANS for the purchase (alluded to under this heading last week) by the Utilities Power & Light Company and other interests of the holdings of the Federal Public Utilities Company, which include the Northeastern Iowa Power Company, formerly owned by Davenport interests, have been explained by H. C. Orton, Dubuque, vice-president and general manager of the Interstate Power Company, a subsidiary of the Utilities Power & Light. Mr. Orton said that the transaction has been pending for some time and that its consummation is now only a matter of time. That the purchase will include the merging of the Northeastern Iowa Power Company with the Interstate Power Company was denied by Mr. Orton, who stated that the plan is to operate all of the Federal Public Utilities Company's holdings as a separate unit. Mr. Orton will continue as vice-president and manager of the Interstate company, and the administrative offices of the new chain of utilities will also be in Dubuque under his direction.

The properties involved, which, as previously announced, have a valuation of approximately $15,000,000, include, besides the Northeastern Iowa Power Company, the Central Light & Power Company of North Dakota, the Southeastern Missouri Public Service Company, the Missouri Power & Development Company, the Arkansas Public Service Company and utility companies in Oklahoma, Texas, Alabama, Louisiana, Michigan, Minnesota and New Brunswick, Canada.

The United Gas Improvement-Philadelphia Electric Company merger will become effective Feb. 14, according to announcement by the special committee of stockholders.

Interests usually associated with Charles H. Tenney & Company, Boston, have made an offer of $125 per share for the stock of the Gloucester Electric Company, serving the Cape Ann district of Massachusetts. Outstanding shares total 20,500 of $25 par value. About 35,000 in population is served by the company. The Tenney interests quite recently enlarged the sphere of their operations by acquiring the Newburyport company and merging it with the Haverhill Electric Company.

The Pennsylvania Edison Company of Easton, Pa., has acquired the Saylorsburg (Pa.) Light & Power Company. Both are General Gas & Electric properties. The Monongahela-West Penn Public Service Company, Fairmont, W. Va., is negotiating for the purchase of the Webster Springs (W. Va.) Electric Light Company.

A certificate merging the Portville Utility Company with the Niagara, Lockport & Ontario Power Company has been filed at Albany, N. Y.

A certificate has been filed in the office of the Secretary of State at Albany merging the Lebanon Valley Lighting Company, Katonah Lighting Company, Amenia Electric Light & Power Company and Morgan Valley Electric Light & Power Company with the Harlem Valley Electric Corporation.

Taxpayers of Yuma, Colo., at a special election on Dec. 27 voted 141 to 53 against the selling of its municipally owned electric light plant to the Commonwealth Utilities Corporation for $90,000.

Application of the Otter Tail Power Company to purchase the electric property at Great Bend, N. D., from the Great Bend Light & Power Company has been approved by the North Dakota commission. The General Service Company has been authorized to buy the electric property at Sanish from J. E. Brusel.

Purchase of the light and power plant at West Fork, Ark., is announced by officials of the Southwest Power Company, McAlester, Okla. The plant will be connected with a transmission line from Fayetteville.

The Southern Indiana Light & Power Company, of which Henry F. Clevenger of Columbus, Ind., is president, has bought the Winterrowd Electric Company holdings at Flatrock.

The Inland Utilities Company is reported negotiating for purchase of the municipal electric light plant and waterworks at New Albany, Miss.

An offer to pay $3,500,000 for the power and distribution plant and the railway at Saskatoon, Saskatchewan, and to divide net profits from their operation with the city has been made by the Dominion Electric Light & Power Company, New York.

Indorsation of the Public Utilities Board of Nova Scotia for a merger of four Annapolis Valley light and power companies into one, to be known as the Annapolis Valley Electric Company, Limited, is being sought. The companies are the Lawrencetown Light, Heat & Power Company, Paradise West Electric Company Bridgetown Electric Light, Heat & Power Company and the Bear River & Digby Electric Light, Heating & Power Company.

Philadelphia Electric's New Building Illuminated

From his home in West Orange, N. J., Thomas A. Edison on New Year's Eve, by tapping a telegraph key, sent an impulse over 90 miles of Western Union wire that inaugurated the floodlighting of the Edison Building, at Ninth and Sansom Streets, Philadelphia—the Philadelphia Electric Company's just completed office building. The upper nine floors of the 22 that the building contains were painted all the colors of the rainbow.

This floodlighting is to continue daily. It is unusual in that moving colors have been used. The spectacle on New Year's Eve showed two of the primary colors in use, red and green, in honor of the Yuletide season. These two colors were shot along the nine upper floors. Green was used along the lower floors and red on the top. White lights were thrown against these, and during the cycle of a half minute every shade in red and green, from a delicate violet to a rose pink, was seen.

Furnace Uses a Million Kw.-Hr. Monthly

Milwaukee Electric Railway & Light Makes Installation for Its Largest Industrial Customer to Serve Heat-Treating Unit of Great Size

WHAT is asserted to be the largest resistance-type electric heat-treating furnace yet manufactured has just been placed in operation by the A. O. Smith Corporation, the Milwaukee Electric Railway & Light Company's largest industrial power customer. The furnace is rated at 3,000 kw. and will use in the neighborhood of 1,000,000 kw.-hr. per month under normal operating conditions. Large oil-refinery stills or vessels weighing as much as 175 tons each will be heat-treated or annealed in the furnace, where the temperature will be maintained at a maximum of 1,650 deg. Fahr. The oil stills are charged into the furnace on special sand-sealed-type furnace cars 12 ft. wide and 70 ft. long.

The furnace is heated by means of heavy cast-nickel-chrome-alloy T-grid heating elements in the side walls of the furnace chamber. The heating elements are divided into six separate circuits, each of which is separately and automatically controlled. Provision has been made by means of special transformers to vary the rate of power or heat input into the equipment over a wide range. The complete furnace installation takes up a floor space approximately 20 ft. wide and 250 ft. long. The heating chamber, car transfer pit and cooling chamber are each 80 ft. in length.

Three 1,000-kw. single-phase transformers connected in closed delta for taking energy at 26,000 volts, three-phase, are used for supplying energy to the furnace. These transformers are contained in an outdoor-type substation which is 12 ft. wide and 60 ft. long. The substation was designed by the distribution engineering division of the Milwaukee company and installed by the installation division of the electric distribution department. The underground division of the same department installed the 26,000-volt underground cables and conduits to the substation. The furnace was designed by and erected under the supervision of the Electric Furnace Company of Salem, Ohio, which also furnished the complete electrical equipment and material necessary for constructing the furnace or heating chamber. The A. O. Smith Corporation designed and built the cooling chamber and the cars and car transfer mechanism.

Briefer News

COLUMBUS, OHIO, WILL ADD 16,000 STREET LAMPS TO ITS SYSTEM.—To improve the city's street lighting system in the coming year, the Columbus (Ohio) City Council has authorized the purchase of 16,192 additional electric lamps.

SAND SPRINGS (OKLA.) POWER COMPANY HAS PROGRAM OF EXPANSION.—A program for expansion, in which $2,500,000 will be expended by the Sand Springs (Okla.) Power, Light & Water Company, has been announced by E. M. Monsell, vice-president. "While the time for the announcement may be somewhat premature," he is quoted as saying, "the $2,500,000 will be ultimately spent."

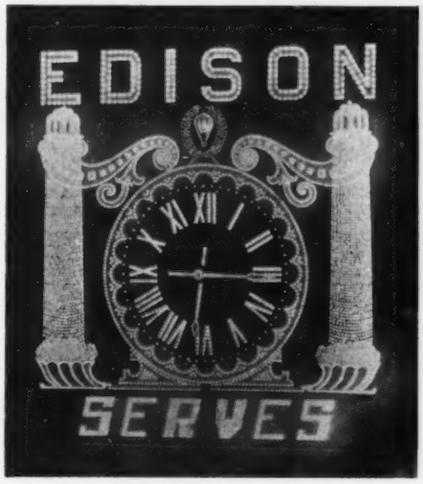
INCREASED VOLTAGE HELPS BUFFALO SUPPLY OF ENERGY.—Substation No. 2 of the Buffalo General Electric Company has been changed over to handle power at higher voltage. Formerly receiving its power supply from Terminal B at 11,000 volts, it now is supplied from Terminal D at 22,000 volts. The change has enabled the station to serve an increasing industrial area without any interruption of power service.

UTILITY COMPANY'S PROTEST BRINGS BIG TAX REDUCTION. — Suits brought by the Northern Ohio Power & Light Company, Akron, Ohio, in the federal court at Cleveland enjoining the collection of the 1925-26 utility taxes in Summit and other counties of Ohio have been settled out of court. Under the settlement the company saves about $125,000 on its Summit County taxes for the two-year period involved. The Northern Ohio contended that its property was listed for taxation at virtually its full value, while other property was listed on a basis of 40 to 50 per cent. The utility company made it plain that it had no desire to evade its taxes, but maintained that the valuation of its property should be reduced or the valuation of other property be raised.

NEW HYDRO PLANTS ON UPPER NEW YORK STREAMS.—The Northern New York Utilities, Inc., will have a market this year for 24,500 additional horsepower, according to General Manager H. G. Davis. The company owns power houses on the Raquette, Beaver, Black and Oswegatchie Rivers. A total of 17,000 of the extra horsepower was taken on Jan. 1 by the St. Regis Paper Company for operation of its mills at Norfolk, Norwood and Raymondsville, all on the Raquette. The rest will be used by the Rome Brass & Copper Company in the operation of a new plant. Jan. 15 will see the completion of power plants at Raymondsville and Norfolk, the former to develop 3,000 hp. and the latter 5,000 hp. A 5,000-hp. plant at Norwood will be finished about Feb. 1, and a plant at East Norfolk of 7,000 hp. some time later.

OLD CINCINNATI RATES SUSTAINED IN LOCAL COURT.—The dispute over rates in Cincinnati has brought a decision in the Common Pleas Court overturning that of a master commissioner and directing the company to re-establish the 1925 rate which the city had endeavored to supersede by new ones designed to save consumers $750,000 a year. (See ELECTRICAL WORLD for Oct. 29, page 904). The Common Pleas Court found a referendum petition on the 1925 rates illegal and the Council's action void. The company charges confiscation and has a suit pending in the federal courts. The city will appeal from the local court's decision just noted.

BOSTON EDISON TALKS WITH, NOT AGAINST, TIME.—By adding a motorgraph talking sign to an illuminated electric clock which has occupied a conspicuous place in the Back Bay district for many years, the Edison Electric Illuminating Company of Boston has



enhanced popular interest in its service. The message of the sign can be read for over a half-mile, and the installation now contains 6,300 15-watt and 2,260 25-watt lamps, the larger size being used in the motorgraph message. This clock weighs 17 tons, is 58 ft. high x 54 ft. wide, has numerals 5 ft. high and minute and hour hands 18 ft. and 14 ft. long respectively.

DETAILS OF NEW COLUMBIA RIVER PROJECT. — Preparatory steps for the seven-million-dollar development projected for the generation of 50,700 electrical horsepower for mining and manufacturing purposes have just been taken in Washington State by the Pend Oreille Lead & Zinc Company of Spokane. An appropriation of 7,000 sec.-ft. of water from the flow of Clark's Fork of the Columbia River is asked for this development, which would be located within the town limits of Metaline Falls, in the northeast corner of the state just below the Canadian border, and be known as the Metaline Falls project. The development would further require 70,000 acre-feet of water storage, providing a total fall for power uses of 80 ft. The diversion dam, to rest upon solid rock formation, will be of rock-filled concrete, 110 ft. high with a top length of 400 ft. and a bottom length of 100 ft. The Clark's Fork River, draining the Pend Oreille lakes in Idaho, would be one of the chief contributory streams to the proposed gigantic Columbia River irrigation project, and because of this proposed future federal undertaking, consent of the United States government as well as of the state must be secured.

KANSAS CITY HAS NEW "WHITE WAY."—Twelfth Street, Kansas City, Mo., has just added to the nation's "great white ways" by installing 80 lamps rated at 120,000 cp. in the area between Wyandotte and McGee Streets. The old lamps had a total of only 19,800 cp. The new ones are set 19 ft. above the sidewalk. They will burn each night from sunset until 1 a.m. and will be turned on again a little before dawn.

LIVELY ELECTRICAL TIMES IN A SMALL COMMUNITY.—Roland, Iowa, a town of only a thousand souls, has held five elections in six months on franchise issues. In the latest a proposal to continue to purchase power from the municipal plant at Story City was defeated by fifteen votes. Two weeks previously a franchise was awarded to the Iowa Railway & Light Corporation by one vote. Litigation threatens to upset this arrangement, although the company immediately cut in its service.

PHILADELPHIA UTILITY OFFICIALS GATHER.—With Arthur W. Thompson, president of the United Gas Improvement Company; Samuel T. Bodine, chairman of the board; Edward T. Stotesbury, Thomas N. McCarter and about twenty other directors acting as hosts, the U.G.I. gave a reception and luncheon on Dec. 30 to the officials of Day & Zimmermann, Inc., and the Philadelphia Electric Company, both now allied with the company first named. Almost every officer and director of the three companies was present, including Walter H. Johnson, president Philadelphia Electric, and John E. Zimmermann. Better mutual acquaintance was the object of the gathering, which may become an annual affair.

TWO NEBRASKA PROJECTS.—The Niobrara Power Company, composed largely of the same group that recently developed the Northern Nebraska Power hydro-electric plant near Spencer, Neb., has been organized for the purpose of constructing a plant on the Niobrara River several miles distant. The company has not yet incorporated, but has made surveys and estimates of cost.—— Power companies serving Nebraska have named a committee of engineers to investigate the feasibility of what is known as the Tri-County project in Adams, Gosper and Frontier Counties. This development, initiated as a public ownership proposition by land owners and business men in the district, who sought to place the credit of the state

behind the necessary thirty-million-dollar bond issue, failed in the Legislature. It is now proposed to carry out the plan with private capital if the project is declared feasible and a market for the energy can be found.

RATING OF IOWA FALLS PLANT GOES TO 30,000 KW. — The Central States Electric Company has started work upon an extension of its steam turbine plant at Iowa Falls, Iowa, to cost $300,000. The first unit to be installed will be of Westinghouse make with a rating of about 3,000 kw. The plant is designed for an eventual capacity of 30,000 kw.

NEW DAM FOR THE OUACHITA.—Its second dam across the Ouachita River in Montgomery County, Ark., to be known as the "Couch Dam," is to be constructed by the Arkansas Power & Light Company at Ola. Soundings have been made, and the company is ready to begin construction as soon as all the necessary land is acquired.

NEW ORLEANS TO HAVE ELECTRICAL SHOW.—The Electrical League of New Orleans announces that it is preparing to sponsor a Louisiana Electrical Exposition, to be held at the Delgado Trades School. It is the intention to organize the exposition on a large scale, and it will have the backing of the New Orleans Public Service, Inc. Dates set are March 5 to March 10.

GROWTH OF MONTANA-DAKOTA POWER COMPANY. — Completion of its high-tension-line construction program for the year 1927 reveals that the Montana-Dakota Power Company has added thirteen towns to the number previously served and has built 103 miles of line. This company now furnishes electrical energy to 70 cities and towns in western North Dakota and eastern Montana through 700 miles of line. It has constructed a power plant at Glendive, Mont., and is building one south of Columbia, N. D.

NEW PUBLIC SERVICE BUILDING AT PORTLAND, ORE.—On Jan. 3 there was a public dedication of the new Public Service Building at Portland, Ore., which has been occupied since Dec. 19 by the three affiliated companies for which it was built. All but six floors of the sixteen-story tower structure flanked by three-story wings are occupied by the Portland Gas & Coke Company, the Northwestern Electric Company and the Pacific Power & Light Company. The building is faced with white stone and has a colonnade course around the top floors. The Northwestern company and the Pacific Power & Light occupy the fourth, fifth and sixth floors respectively; the treasury departments of the three companies are on the seventh and eighth floors, and the presidents' offices and those of the legal department and the directors' room are on the fifteenth. Special attention was given to the lighting of the offices and salesrooms, both of which have a higher intensity than other commercial establishments of their kind in the city.

DECATUR (ILL.) SERVICE IMPROVED. —The Illinois Power & Light Corporation last year expended $500,000 in improvement of its electric service in Decatur, Ill., the completion of two new transmission lines, making three interconnecting lines into the city, being the outstanding development. Seventy miles of lines were added to the distribution system, and a new substation, housing a 5,000-kw. synchronous condenser, was another improvement.

RIVERSIDE (CAL.) MUNICIPAL PLANT LOWERS RATES.—A reduction in lighting rates that is calculated to save city consumers $25,795 annually has been adopted by the City Council of Riverside, Cal. This saving is based on a reduction from 8 cents to 7 cents per kilowatt-hour. Accumulation of funds in the light and water department has been the cause for much dissatisfaction among consumers who believed rates should be reduced even if taxes were raised in consequence.

SAMUEL FERGUSON ON FLOODS AND INTERCONNECTION. — Samuel Ferguson, president of the Hartford Electric Light Company, in speaking of the unprecedented November floods in New England, said recently: "The floods in New England have proved beyond question the value of interconnecting electric systems in maintaining service under conditions which must have incapacitated isolated generating plants. A few years ago the flooding of the great Vernon plant of the New England Power Company would have been a disaster to thousands. When it was flooded recently it made no difference at all to the company's customers owing to its interconnection with other plants in New England, New York and elsewhere, which enabled it to keep the service going."

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published on page 80 of this issue.]

American Engineering Council—Washington, D. C., Jan. 9-11. L. W. Wallace, 26 Jackson Place, Washington.

Empire State Gas and Electric Association—Electric Section, Niagara Hotel, Niagara Falls, N. Y., Jan. 12 and 13. C. H. B. Chapin, Grand Central Terminal, New York.

Electrical League Conference — 30 North Dearborn Street, Chicago, Jan. 16 and 17. Society of Electrical Development, 420 Lexington Avenue, New York.

New England Electrical Credit Association—Boston, Jan. 17. C. A. Kane, 176 Federal St., Boston.

N.E.L.A. Commercial Section—Edgewater Beach Hotel, Chicago, Jan. 18-20. A. J. Marshall, 420 Lexington Avenue, New York.

National Electrical Manufacturers' Association — Supply Division, Hotel Commodore, New York, Jan. 23-27. S. N. Clarkson, 420 Lexington Ave., New York.

Artistic Lighting Equipment Association—Winton Hotel, Cleveland, Jan. 25-28. G. P. Rogers, 711 Graybar Bldg., New York.

Northwest Association of Electrical Inspectors—Olympic Hotel, Seattle, Jan. 26-28. F. D. Weber, 414 Lumbermen's Building, Portland, Ore.

American Institute of Electrical Engineers — Winter convention, New York, Feb. 13-16. F. L. Hutchinson, 33 West 39th St., New York.

Rocky Mountain Division, N.E.L.A.—Albuquerque, N. M., Feb. 14-16. O. A. Weller, 900 15th St., Denver.

Midwest Power Conference — Hotel Stevens, Chicago, Feb. 14-17. G. E. Pfisterer, 53 West Jackson Blvd., Chicago.

Northwest Electric Light and Power Association — Commercial Section, Portland, Ore., Feb. 20 and 21. J. C. Plankington, Northwestern Electric Company, Portland, Ore.

BUREAU OF MINES WILL LEND ELECTRICAL FILMS.—From the Pittsburgh experiment station or any distributing center the Bureau of Mines of the United States Department of Commerce will lend freely motion-picture films produced under the bureau's direction and showing mining and manufacturing processes. Several are of interest to electrical men, including three covering the "Story of Coal," three on the "Story of an Electric Meter," two on "Water Power," and two on the "Story of a Storage Battery."

ST. LAWRENCE RAPIDS DEVELOPMENT IS BROACHED.—Notice has been filed at Ottawa by the Montreal & Western Canada Company that the company will apply at the forthcoming session of the Canadian Parliament for authority to develop the rapids in the St. Lawrence River below Cornwall, Ontario. The proposed scheme is a very ambitious one. The company would build a 30-ft. waterway between Cornwall and Montreal and exploit the power incidental thereto. Those connected with the company are not mentioned in the notice.

NEW BRAUNFELS (TEX.) PLANT'S GENERATING CAPACITY WILL BE DOUBLED.—Plans already hinted at have been finally adopted for doubling the capacity of the electric power plant at New Braunfels, Tex., of the Comal Power Company, subsidiary of the San Antonio Public Service Company, at a cost of $1,500,000, according to E. H. Kifer, general manager. In addition to its own service, the Comal Power Company sells power to the Texas Power & Light Company and the Central Power & Light Company. The San Antonio company will also spend in its home city $750,000 for laying underground cables and construction of substations. The South Texas Public Service Company, another subsidiary, will spend $150,000 for constructing rural transmission lines and connections.

TEXARKANA (ARK.) PLANT TO BE DOUBLED. — Material improvements in the power plant of the Southwestern Gas & Electric Company at Texarkana are under way. They include an addition to the boiler house and the installation of two boilers with a total rating of 1,520 hp.; a concrete stack 200 ft. high, an addition to the turbine room, where a 5,000-kw. turbo-generator will be installed, and various auxiliary equipment. The total capacity of the plant will be more than doubled.

News About Men of the Industry

L. P. HITE has been appointed manager of the Paducah district of the Kentucky Utilities Company to succeed R. A. Becker, who resigned because of ill health. Mr. Hite has been superintendent of production in charge of western Kentucky power plants, with headquarters at Earlington since last spring, and for a year previous to that connection he was manager of the Morganfield district. He affiliated himself with the company in March, 1926, after being in charge of the municipal electric plant at Henderson, Ky. W. C. Shields has been selected to succeed Mr. Hite as superintendent of production for Western Kentucky.

ANDREW C. ERWIN, president of the Athens Publishing Company, has been elected director of the Georgia Power Company to succeed the late J. Billups Phinizy. A native of Athens and a graduate of the University of Georgia, Mr. Erwin became prominent when he re-organized the Citizens Bank of Athens and later was made president of the Commercial National Bank. He has served the city of Athens as mayor and also as president of the Chamber of Commerce.

K. T. KONE has been appointed sales manager of the Panhandle Power & Light Company, Borger, Tex., which is controlled by the United Light & Power Company. Mr. Kone has engaged in sales work for the United companies since 1922.

GEORGE BARBER has been named sales manager for the southern district of the Puget Sound Power & Light Company, with headquarters in Chehalis, Wash. He is succeeded as sales manager in the northern district by R. W. Lindley.

J. PAUL CLAYTON, vice-president of the Central Illinois Public Service Company, Springfield, Ill., has been appointed chairman of the industrial development committee of the Illinois Chamber of Commerce. Mr. Clayton was formerly a director and vice-president of that same organization.

HORACE B. STOUT, counsel for the Railroad and Public Utilities Commission of the State of Tennessee for the past three years, has resigned. Mr. Stout has recently formed a law partnership and is leaving the commission to devote his time to private practice.

W. G. GAY, formerly industrial sales engineer of the Baton Rouge Electric Company, has been appointed sales manager to succeed H. P. Geisler, Jr. Mr. Gay started with the Stone & Webster organization in 1910 at the Boston office. He began power station work in Minneapolis and subsequently became chief engineer at New London, Conn., in 1916. Later he removed to Pawtucket, but he was transferred to Baton Rouge in 1919, where he served as chief engineer until he was made industrial sales engineer in 1926.

J. C. Guild Succeeds Edgar in Chattanooga

J. C. Guild, Jr., has been appointed general manager of the Tennessee Electric Power Company to succeed the late B. C. Edgar, according to an announcement made by President B. C. Cobb. A native of Chattanooga and a graduate of Vanderbilt University, Mr. Guild has been serving as vice-president of the company for several years.

R. L. KIRK has been appointed assistant to the system development manager of the Duquesne Light Company, Pittsburgh. A graduate of the Carnegie Institute of Technology, Mr. Kirk was first employed by the Duquesne organization prior to the United States' participation in the World War. In 1922 he returned to the company, where he has occupied successively the positions of designer, section engineer, general engineer, assistant to the vice-president and work progress engineer.

JAMES W. REED, for three years manager for the Kentucky Utilities Company at Carlisle, has been transferred to Clinton in the capacity of manager. F. J. HARDESTY of the Fulton staff of the company has removed to Carlisle as manager.

C. I. ISLEY, formerly local manager at Florence, S. C., for the Carolina Power & Light Company, has been transferred to the Asheville (N. C.) division of the company in the capacity of appliance sales manager.

L. H. KNAPP, formerly connected with the industrial electric heating department of the General Electric Company, Schenectady, N. Y., has been appointed industrial electric heating engineer of the Hartford (Conn.) Electric Light Company.

H. S. CHANDLER, who has been connected with the Georgia Power Company at various times for the past 20 years, has been appointed sales manager for the Illinois Power Company at Decatur.

BOND P. GEDDES of Washington, D. C., has been appointed executive vice-president of the Radio Manufacturers' Association to succeed L. S. Baker, resigned. Mr. Geddes brings to his new position a background of seventeen years of experience in press and public relations work in and outside of Washington. In addition to his newspaper, press association and public relations experience, Mr. Geddes has had legal training and is a member of the bar of the District of Columbia and a graduate of Columbia University. He assumed his new duties Nov. 1 at the Eastern headquarters of the Radio Manufacturers' Association in New York.

HERMAN MEZGER has recently joined Stone & Webster, Inc., as an engineer in the electrical division. He was formerly with the Brazilian section of the Foreign Department of the Allgemeine Elektrizitäts Gesellschaft of Berlin. Since coming to this country he has been with the Westinghouse Electric & Manufacturing Company at East Pittsburgh.

WALLACE S. WICK of Des Moines has been named as manager of the Oskaloosa properties of the Iowa Power & Light Company, succeeding J. H. Porter, resigned.

EARL UTLEY has been appointed local manager for the Kentucky Utilities Company at Clay, Ky., to succeed C. E. Utley, his father, who resigned Dec. 1 to enter other business.

W. R. JESSUP is the new superintendent of the Lake Andes (S. D.) division of the Northwestern Public Service Company.

W. M. FLOOK, chairman of the board of the American Brown Boveri Electric Corporation, has been elected its president.

A. W. ATWATER, for the past two years a partner in the engineering contracting firm of the Martin & Warlick Company, Chattanooga, Tenn., and formerly in the power-plant engineering field at Columbus, Ohio, has joined the mechanical engineering division of Stone & Webster, Inc., at Boston.

EDWARD DICKSON has been appointed manager of the Trezevant plant of the Kentucky-Tennessee Light & Power Company.

Obituary

HARRY E. HAYES, for many years assistant engineer on the electrical staff of Charles H. Tenney & Company, Boston, Mass., died Dec. 30 at his home in Stoneham at the age of 62. He was a native of Madbury, N. H., was educated at Harvard College and the Massachusetts Institute of Technology, and in recent years had specialized in underground construction work for the North Boston Lighting Properties.

W. F. HARVEY, president of the Porcelain Insulator Corporation, Lima, New York, died suddenly Jan. 4 at his home in Lima.

Financial and Statistical News

December Breaks All Financing Records with $303,332,500 Total

WITH A total of well over $300,000,000, December broke all previous records of monthly financing by power and light companies. In line with the relative proportions of refunding and new money existing during the previous eleven months, approximately half of this was for refunding purposes. December's figure constituted more than 14 per cent of the year's total.

The cost of money continued its downward trend during the year so that by December, financing could be carried out on a very favorable basis. Six of the sixteen bond (or note) issues sold were on a 4½ per cent basis, and on eight of these the yield was less than 5 per cent.

Among the largest issues of the month were two $40,000,000 issues, one sold by Alabama Power Company and the other by Duke Power Company, and a $60,000,000 issue sold by Philadelphia Company. Each of these three has a life of 40 years. Most of the month's financing was relatively long term.

An analysis of the year's financing will be found elsewhere in this issue.

AMERICAN WATER WORKS ISSUES DEBENTURES.—During the first week of January, 5 per cent gold debentures of the American Water Works & Electric Company were offered in the amount of $3,000,000, the price being 95 and interest. These debentures, dated Dec. 1, 1927, and maturing Dec. 1, 1975, will be direct obligations of the company. Proceeds will be used to reimburse the company in part for expenditures in connection with the acquisition of additional properties, for additional working capital and for corporate purposes.

British Energy Consumption Up 57 per Cent in Five Years

The latest available figures for consumption of electricity in Great Britain are given in the annual report of the Electricity Commissioners for the period April 1, 1926, to March 31, 1927, which has just been issued. They show that the sales of energy by authorized undertakings to consumers amounted in 1926 to 5,723,000,000 kw.-hr. and represented an increase of about 57 per cent on the sales in 1922. This was an average consumption of about 130 kw.-hr. per head of the estimated population of the United Kingdom in 1926. The sales of electricity for power purposes increased during five years from 2,499,000,000 kw.-hr. to 3,760,000,000 kw.-hr., or by 50 per cent. Sales for lighting and other domestic purposes increased from 582,000,000 kw.-hr. to 1,244,000,000 kw.-hr., or by over 113 per cent. Those figures do not take into account the supply for traction purposes and the supply con-

SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN DECEMBER

Name of Company	Amount of Issue (Par Value)	Period Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Louisiana Power & Light Co.	$8,000,000	30	First mortgage gold bonds	Construction	5	97⅞	5.15
Connecticut Light & Power Co.	6,500,000	..	Cumulative preferred stock	To provide funds for construction purposes	5½	100	5.50
United Public Service Co.	1,000,000	..	Preferred stock	Construction, new property acquisition and for other corporate purposes	7	100	7
El Paso Electric Co.	1,000,000	23	First mortgage gold bonds, series A	To retire indebtedness incurred by the company in its construction program	5	101	4.92
Alabama Power Co.	40,000,000	40	First and refunding mortgage gold bonds	To retire bonds, to purchase additional equipment and for other corporate purposes	4½	94⅜	4.80
Wisconsin-Hydro Electric Co.	800,000	..	Cumulative preferred stock	Acquisition of properties	6	95	6.32
Central Public Service Corp.	4,500,000	13	Collateral trust gold bonds, series A	To pay for the acquisition of properties, to retire indebtedness and for other corporate purposes	6	97½	6.30
Duke Power Co.	40,000,000	40	First and refunding mortgage gold bonds	To reimburse for expenditures on additions, to retire floating debt and for other corporate purposes	4½	98	4.61
Philadelphia Co.	60,000,000	40	Secured gold bonds	To retire all present mortgage indebtedness, to purchase additional stock and for other corporate purposes	5	98	5.11
Central Maine Power Co.	2,000,000	30	First and general mortgage gold bonds, series E	To reimburse for cost of additions and for the acquisition of new properties	4½	98	4.62
Binghamton Light, Heat & Pwr. Co.	1,020,000	..	Cumulative preferred stock	To reimburse treasury in part for the cost of additions and betterments to property	6	102	5.88
Duquesne Light Co.	20,000,000	..	Cumulative first preferred stock	To retire stock and for other corporate purposes	5	97½	5.12
Associated Electric Co.	20,000,000	25	Gold bonds	To acquire or retire securities of subsidiaries	4½	94½	4.90
Central Illinois Public Service Co.	4,200,000	1-3	Serial gold notes	Refunding	4½	100	4.50
	29,000,000	40	First mortgage gold bonds, series F		4½	94⅜	4.80
Wisconsin Power & Light Co.	6,350,000	29	First lien and refunding mortgage gold bonds, series E		5	101½	4.90
Central Gas & Electric Co.	7,000,000	20	First lien collateral trust sinking fund gold bonds	Acquisition of new properties, to retire indebtedness and for other corporate purposes or to reimburse company	5½	98½	5.62
	2,362,500	..	Preferred stock	To acquire new properties, to retire indebtedness and for other corporate purposes	6½	94½	6.87
	3,500,000	3	Gold notes		5½	99½	5.75
Florida Power & Light Co.	10,000,000	27	First mortgage gold bonds	To reimburse for extensive additions to property and for other corporate purposes	5	97½	5.15
Central States Power & Light Corp.	8,500,000	25	First mortgage and first lien gold bonds	To retire securities of corporation and of subsidiaries, to pay for acquisition of properties and for other corporate purposes	5½	98½	5.60
	3,000,000	..	Preferred stock		7	100	7
American European Securities Co.	2,000,000	30	Collateral trust sinking fund bonds		5	99	5.07
Indiana Electric Corp.	2,600,000	24	First mortgage and refunding gold bonds		5	98½	5.10
Central States Electric Corp.	20,000,000	20	Convertible debentures	To liquidate indebtedness, to acquire additional investments and to redeem outstanding debentures	5	96½	5.28

Total	$303,332,500
Total amount actually realized	$293,415,102
Rights	$41,199,325
Total financing for December	$334,515,427

sumed in manufacturing and trading operations derived from privately owned generating plants. At the beginning of 1920 the number of bulk supplies which had been taken or arranged for was 120—namely, 70 by local authorities and 50 by companies. On March 31, 1927, the number of such supplies actually taken or arranged for had increased to 351—199 by local authorities and 152 by companies.

Northern States Power Shareholders Offered Rights

ADDITIONAL capital is being secured by Northern States Power Company through the issue of rights to shareholders. Holders of class A and class B common stock have been offered the privilege of subscribing for the new stock to the extent of one-quarter of their present holdings.

To make provision for the new issue, the directors have authorized the sale of additional class A stock to the extent of one-quarter of the aggregate amount outstanding at the close of business Jan. 3. Additional B stock is being issued on a similar basis. The proceeds of the issue will be used for extensions and additions to the company's property. The offering, it is announced, has been underwritten without cost to the company.

Common stock class A now outstanding amounts to $17,967,600. The addition of one-quarter this amount would bring the total up to more than $22,000,000. Class B stock outstanding totals $5,000,000 and the addition of one-fourth this amount would bring the total to $6,250,000.

Electricity Supply in Roumania

According to a recent official return, there are now 146 electric power stations in operation in Roumania. Of the total, 31 plants, or about 21 per cent, are hydro-electric; 44, or 28 per cent, are steam-operated, while 71, or approximately 50 per cent, utilize internal-combustion engines for the generation of power. The total installed capacity is about 174,300 kw. There are 86 plants with a combined capacity of 26,500 kw. producing continuous current, three single-phase alternating-current plants totaling 5,200 kw., two two-phase stations producing 10,000 kw. and 55 three-phase stations with an aggregate of 132,600 kw.

BIGGEST JAPANESE ELECTRIC COMPANIES UNITE.—The terms for consolidating the Tokio Electric Light and the Tokio Electric Power companies are now practically complete, according to the latest Japanese announcement. The companies constitute 15 per cent of the total capital of the electrical industry of Japan, and 19 per cent of the generating capacity.

Prolonged rate-cutting in the Tokio area prompted financial interests to exert their influence in effecting this amalgamation. Another important factor in negotiating the merger was the consideration that further foreign capital, which the industry requires, would be difficult unless competition was eliminated. The basis of the fusion is nine shares of the light company to ten of the power company.

IDAHO POWER SELLS PREFERRED.—The sale in thirty days of an entire new issue of 10,000 shares of preferred stock, mainly to customers, was an accomplishment of the Idaho Power Company, Boise, in the latter part of last year. The stock, which was a $6 cumulative no par stock, offered at $100, brought $1,000,000 into the company treasury for improvements and additions and other corporate purposes. It was absorbed locally, principally in small blocks sold by employees. The issue was authorized by the former stockholders and given the same position in the financial structure with respect to rights and privileges as is enjoyed by the older issue of 7 per cent preferred stock, all of which had been sold out long since. The new stock is callable at $110.

BUFFALO, NIAGARA & EASTERN INCREASES DIVIDEND RATE.—The board of directors of the Buffalo, Niagara & Eastern Power Corporation has authorized an increase in the dividend rate on common stock of that company. The increase is from 25 cents to 30 cents per share in the quarterly dividend. This increase will be received by common stockholders in the dividend checks which are sent out on Dec. 31.

Immobility a Prime Factor in Plant Valuation

IN DISCUSSING "The Valuation of Public Utilities" before the American Economic Association, Arthur Twining Hadley, president emeritus of Yale University, among other things said:

"Valuation and assessment are quite distinct things. An assessment is a price fixed by a constituted authority for its own purposes. A valuation is an attempt to determine what a piece of property is worth. A value is created by public demand, not by political authority. It is calculated on the basis of 'fair market price.'

"Until recently the words value and valuation had their definite meaning in American law, as they still have it in American business usage. But about 30 years ago, Senator La Follette, in his attempt to find a basis for judging whether rates were reasonable, assessed the cost of duplication of the railroads concerned and called the result physical value.

"Was he justified in applying the old and well-understood name value to such an assessment? Those who say yes base their answer on three different grounds.

"The first group says that they have discovered another kind of value, a physical value as distinct from a commercial value. The obvious answer is that there was no such thing to discover. Physical value is a contradiction in terms. Value is a social phenomenon, not a physical one. Value is not a thing inherent in goods themselves. It is a result of their adaptation to the needs and wants of the people; in other words, of demand.

"The second group sees that physical value is a fiction, but holds that duplication cost furnishes a good measure of value. The answer is that it is a very bad measure. We can find many railroad lines whose cost of duplication would be more than ten times as great as their commercial value to their present owners or to any other owners. A yardstick that is liable to an error of over 1,000 per cent cannot be called a good measuring rod.

"A third group, more intelligent than the other two, sees that cost is not a kind of value, and is not a good measure of value as it is, but says that it is a good measure of value as it ought to be. If an ordinary merchant, investing prudently, finds it hard to make over 6 per cent, 6 per cent on prudently invested capital ought to be enough to allow the investors in large corporations.

"The difficulty with this answer is that large investments in progressive industries are subject to risks from which merchandise is free. You cannot limit the profits of the successful concerns to the ordinary rate of commercial discounts without preventing developments and improvements. We have had a signal example of the failure of the attempt in the history of railroad development in recent years.

"If there is not enough demand for a given sort of merchandise in one place, it can be sent to another. If there has been an over-production of that merchandise which makes prices too low everywhere, the surplus supply can soon be used up. The consequence is that the price of merchandise seldom falls very far below cost. But in the case of fixed investment, the matter is different.

"The capital, once invested in a power plant or railroad, must stay where it is and cannot go somewhere else. If the local demand falls short of the expectation, the risk involved in locating a plant in a new territory is very great. The risk in developing new processes with it is greater still."

NEW YORK UTILITY REDUCES NUMBER OF SHARES.—The New York State Gas & Electric Corporation, Ithaca, has filed a certificate in the office of the Secretary of State reducing the number of shares of its no-par-value stock from 125,000 to 100,000.

Business News and Market Conditions

Electrical Exports Show Normal Growth

Increase for 1927 is nearly 4½ per cent. European markets expand, while Western Hemisphere shows a decrease of $4,000,000

By Marshall T. Jones
Chief Electrical Equipment Division,
Bureau of Foreign and Domestic Commerce, Washington, D. C.

EXPORTS of electrical equipment for 1927 show an ever-increasing trend over former years. The total value of materials shipped abroad in 1926 was $98,495,245, as compared with $94,243,813 exported during the first eleven months of 1927. Details for the first 10 months of 1927 are shown in the accompanying table and compared with 1926. If the average for the first eleven months is taken to cover December shipments, the total for 1927 will run to $102,811,432, or an increase of 4.4 per cent over 1926.

As regards commodities, exports of direct-current and alternating-current generators and parts, including steam turbine sets, show a slight loss for 1927, amounting to about 7½ per cent, predicating this percentage on the basis of twelve months. The largest percentage loss was shown in the transformer classes, amounting to 25 per cent, in value nearly $900,000. Watt-hour, volt, and other meters also showed a slight loss of about 5 per cent. Domestic heating and cooking devices registered about an 11 per cent loss. Telephone equipment was another item that fell off to the amount of about 25 per cent. Gains, however, are shown for such items as motors, electric fans, lamp bulbs, motor-driven household devices, and electric light fixtures. The most startling gain was shown in the exports of domestic washing machines, amounting to 45 per cent, in value a gain of $424,000. Next come motor-driven household devices, such as vacuum cleaners, etc., showing a gain of 35 per cent, or $608,000 in value.

Radio receiving sets and equipment show a gain of only 2 per cent, amounting roughly, to $138,000, but this class of material amounts to approximately 8 per cent of the total exports, constituting the largest single class item. Flashlights and flashlight batteries have shown a decided increase as regards their exportation, gaining nearly $1,000,000 in value over 1926 figures.

Canada is our outstanding export market, consuming roughly 20 per cent of our total exports. Shipments to Canada during 1927 show a 10 per cent increase over those of 1926. The Western Hemisphere, owing to the fact that Canada is included therein, takes half of the total shipments, with Europe consuming about 14 per cent, the balance going to the remainder of the countries of the world. For the first eleven months of 1927 an increase of shipments to Europe over the total for 1926 is already shown, amounting to more than $1,000,000, whereas shipments to the Western Hemisphere have decreased by about $4,000,000. Our largest loss is shown in our trade with Japan, which is only a little more than half the figure shown for 1926. Australian trade has

Value of Electrical Exports for 1926 and for Ten Months of 1927 Compared with Same Period in 1926

(Compiled from data issued by Bureau of Foreign and Domestic Commerce)

Articles	Year 1926	Ten Months 1926	Ten Months 1927
Generators:			
Direct-current:			
Under 500 kw.	$959,830	$765,477	$706,395
500 kw. and over	454,150	429,254	323,494
Alternating-current:			
Under 2,000 kva.	187,675	163,137	153,678
2,000 kva. and over	1,273,273	1,074,644	743,299
Steam turbo-generator sets	1,412,086	1,021,196	722,264
Accessories and parts for generators	919,823	699,022	917,513
Self-contained lighting outfits	1,151,144	911,041	1,080,868
Batteries:			
Flashlight batteries	1,674,309	1,289,743	1,772,093
Other primary batteries	2,020,298	1,663,909	2,023,040
Storage batteries	3,443,121	2,798,216	3,033,597
Transforming or converting apparatus:			
Power transformers	2,230,743	1,696,727	1,219,594
Other transformers	1,266,076	1,042,120	895,605
Rectifiers, double-current and motor-generators, dynamotors, synchronous and other converters	1,556,654	1,310,083	1,323,316
Transmission and distribution apparatus:			
Switchboard panels, except telephone	2,193,265	1,986,255	1,205,331
Switches and circuit breakers over 10 amp.	2,618,212	2,178,642	1,560,915
Fuses and fuse block	351,686	292,173	302,218
Watt-hour and other measuring meters	492,828	407,802	353,723
Volt, watt and ampere meters and other recording, indicating and testing apparatus	2,152,257	1,736,226	1,673,345
Lightning arresters, choke coils, reactors and other protective devices	708,823	580,355	585,676
Motors, starters and controllers:			
Motors under 1 hp	1,999,587	1,632,607	2,167,062
Stationary motors:			
1 to 200 hp	3,207,141	2,679,282	2,566,434
Over 200 hp	884,354	806,733	318,771
Railway motors	1,126,836	985,886	730,976
Electric locomotives:			
Railway	1,841,606	1,745,989	654,895
Mining and industrial	759,275	584,552	370,723
Starting and controlling equipment for:			
Industrial motors	1,394,687	1,154,580	920,997
Electric railway and vehicle motors	202,821	179,106	180,398
Portable electric tools	549,340	430,286	745,207
Accessories and parts for motors	2,180,747	1,852,858	1,999,413
Electric appliances:			
Electric fans	948,124	824,625	917,413
Electric lamps:			
Metal filament	1,603,230	1,336,399	1,290,565
Other electric lamps	280,929	217,746	341,194
Flashlights	2,057,673	1,715,641	2,010,308
Searchlights and projectors	573,968	350,360	665,464
Motor-driven household devices	1,743,677	1,393,127	1,959,921
Domestic heating and cooking devices	1,722,381	1,318,089	1,169,723
Industrial electric furnaces and ovens	253,307	183,180	355,017
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc.	1,477,521	1,213,445	1,375,669
Signal and communication devices:			
Radio apparatus:			
Transmitting sets and parts	555,640	417,214	293,701
Receiving sets	2,873,676	2,049,336	2,068,995
Tubes	867,631	719,251	825,776
Receiving-set components	2,016,466	1,511,262	1,806,752
Receiving-set accessories	2,501,042	1,860,930	1,891,314
Telegraph apparatus	1,018,224	829,996	818,258
Telephone apparatus:			
Telephone instruments	419,940	373,661	298,958
Telephone switchboards	2,218,587	2,109,873	715,522
Other telephone equipment	2,467,715	2,022,612	2,323,714
Railway signals, switches and attachments	505,460	420,100	656,374
Bells, buzzers, annunciators and alarms	296,348	249,890	275,133
Other electric apparatus:			
Spark plugs, magnetos and other ignition apparatus	1,904,103	1,681,707	1,718,882
Insulating material	1,380,142	1,169,770	1,132,946
Metal conduit, outlet and switch boxes	1,163,647	977,814	860,474
Sockets, receptacles and lighting switches	1,717,890	1,392,388	1,488,286
Electric lighting fixtures, interior and street	1,860,225	1,537,468	1,518,629
Other wiring supplies and line material	1,164,208	1,000,353	1,197,881
Other electrical apparatus, not elsewhere stated	7,422,890	6,102,594	6,170,674
Rubber and friction tape	352,310	288,432	358,798
Globes and shades for lighting fixtures	598,210	490,686	500,481
Electrical glassware, except for lighting	485,593	395,178	195,631
Electrical porcelain:			
For less than 6,600 volts	756,668	669,391	476,139
For 6,600 volts and over	787,007	688,887	510,281
Carbons, carbon brushes and electrodes:			
Electrodes for electric furnaces	1,640,837	1,381,863	1,463,768
Other carbon products	1,354,657	1,050,849	1,135,899
Insulated wire and cable (iron and steel)	275,906	216,171	171,376
Copper, bare wire	2,247,861	1,960,614	1,524,384
Copper, insulated wire and cable	4,916,008	4,210,621	4,347,769
Refrigeration sets up to 1 ton capacity	*	*	2,823,633
Domestic washing machines	*	149,840	194,747
Total	$97,642,348	$80,579,258	$81,101,289

*Figures not collected.

Imports of Electrical Apparatus Into United States by Commodity and by Country of Origin January-November, 1927

(Data furnished by the Bureau of Foreign and Domestic Commerce)

Article	First Quarter	Second Quarter	Third Quarter	October and November
Carbon-filament incandescent electric lamps:				
Miniature	$16,324	$59,858	$151,565	$160,217
Other lamps	254,407	137,723	125,989	97,035
Metal-filament incandescent electric lamps:				
Miniature	19,901	4,642	14,027	7,066
Other lamps	70,753	35,428	12,486	24,739
Other electric lamps, including neon, etc	1,375	6,440	911	1,966
Generators	210	.....	6,728	.....
Transformers	.....	3,437	.....	.....
Converters, double-current and motor-generators, dynamotors and other converting apparatus	147	.....	35	.....
Switches, circuit breakers, fuses, choke coils, reactors, sockets, plugs, etc.	1,438	1,594	1,582	2,455
Motors, stationary, railway, vehicle, automotive, and other	6,104	2,218	468	878
Electric fans and blowers	32	26	.....	.....
Table household, kitchen and hospital utensils and similar hollow or flat ware containing electrical heating element:				
Electric flatirons	17	143	101	6
Iron or steel-enameled or glazed with vitreous glasses	149	425	1,005	500
Copper, brass, steel or other base metal	1,416	456	300	358
Industrial electric furnaces and ovens	.....	345	101	.....
Therapeutic apparatus and X-ray machines	797	1,535	775	896
Radio and wireless apparatus and parts	10,198	119,688	115,469	85,801
Telegraph apparatus	2,226	58	2,125	631
Telephone apparatus	184	251	.....	299
Storage batteries and parts	2,773	1,642	5,950	1,137
Batteries other than storage	106	5	155	390
Electrical machinery and parts	288,714	433,114	222,490	169,818
Electric apparatus and parts	19,192	51,209	32,005	44,282
Total	$696,463	$860,237	$694,267	$598,474

Country	First Quarter	Second Quarter	Third Quarter	October and November
Austria	$77,527	$5,434	$11,405	$19,505
Australia	4	.....	.....	10
Azores and Madeira Islands	.....	.....	39	.....
Belgium	1,218	303	35	.....
Brazil	10	8	31	.....
British West Indies	10	.....	.....	.....
Canada	5,440	11,261	10,170	9,335
Ceylon	7,423	.....	.....	.....
China	3,401	.....	17	55
Cuba	256	3	.....	5
Czechoslovakia	13,316	263	968	632
Denmark	.....	228	.....	.....
France	12,013	18,982	5,781	6,280
French Oceania	.....	90	.....	.....
Germany	187,790	195,050	226,864	171,731
Hungary	1,530	.....	.....	.....
Irish Free State	.....	.....	4	.....
Italy	562	1,300	844	410
Japan	105,848	153,895	207,342	203,472
Mexico	260	.....	.....	300
Netherlands	937	430	2,200	5,336
Norway	.....	33	.....	.....
Philippine Islands	.....	.....	7	.....
Rumania	4	.....	.....	.....
Spain	120	58	124	194
Sweden	66,025	78,133	32,682	120,686
Switzerland	198,433	261,412	160,776	8,398
United Kingdom	14,336	133,354	34,978	52,125
Total	$696,463	$860,237	$694,267	$598,474

also slightly decreased, as well as that with New Zealand and India. The Philippine Islands, however, have made up for some of this loss in the Far East. South and Central America, with the exception of Argentina, Brazil, and Colombia, show slight increases, whereas our Chilean trade has dropped off $3,000,000.

Virtually every European country has taken more electrical goods from us than they did in 1926, showing that our market there is slowly developing and furthermore that such growth is about equally distributed among all the countries. In general, the year's trade shows a normal growth along a great many lines, indicating that American manufacturers are slowly but surely pushing ahead to develop their foreign markets.

Energy Consumption Per Domestic Customer

The accompanying table giving the energy consumption per domestic customer is based on kilowatt-hours sold to domestic customers and number of customers reported by 72 companies for the year 1926.

Section	No. Companies Reporting	Minimum	Average	Maximum
New England	6	259	339	440
Middle Atlantic	10	161	399	680
South Atlantic	4	256	404	550
East North Central	20	231	380	569
West North Central	7	275	383	468
East-South Central	5	298	337	371
West-South Central	6	268	334	384
Mountain	5	129	338	518
Pacific	9	122	463	815

Imports of Electrical Apparatus Into United States

With this issue of the ELECTRICAL WORLD a compilation giving the imports of electrical apparatus into the United States by commodity and by country of origin for the first, second and third quarters and the last two months of this year is presented. The figures for the first and second quarters have appeared previously, and figures for every succeeding quarter will be printed as soon as available. No particular articles stand out prominently in the table, nor is there an abnormal amount of any particular commodity imported. For the first half of the year Switzerland heads the list with $459,845, Germany comes second with $382,840 and Japan is third with shipments of $259,743.

Appliance and Merchandise Sales for 1926 and 1927

(Compiled by *Electrical Merchandising*)

NOTE: These figures were compiled by *Electrical Merchandising* from sales records of associations and manufacturers and from estimates made by association executives and leading manufacturers.

Appliance and Merchandise	1926 Number Sold	1926 Retail Value	1927 Number Sold	1927 Retail Value
Cleaners	1,065,000	65,000,000	1,028,000	49,344,000
Clocks	90,000	2,250,000	95,000	2,500,000
Cookers (660 watts and under)	175,000	1,750,000	200,000	1,800,000
Dishwashers	6,500	1,040,000	9,000	1,440,000
Fans	1,000,000	15,250,000	750,000	11,250,000
Fixtures, residential	13,000,000	78,000,000	15,000,000	75,000,000
Flashlights and renewal batt's	.....	40,000,000	.....	44,000,000
Floor polishers	90,000	5,400,000	100,000	6,000,000
Heating pads, etc	230,000	1,840,000	255,000	1,657,500
Hot plates, grills and table stoves	300,000	1,800,000	315,000	1,890,000
Ironing machines	57,000	8,835,000	68,000	10,880,000
Irons	3,000,000	16,000,000	3,000,000	14,250,000
Lamps, incandescent	500,000,000	170,000,000	538,000,000	160,000,000
Lighting units, commercial	2,000,000	24,000,000	1,800,000	22,000,000
Percolators	400,000	6,000,000	450,000	5,400,000
Portable lamps and shades	6,000,000	80,000,000	6,000,000	72,000,000
Plugs, pural	3,000,000	1,200,000	3,000,000	1,200,000
Radiators and heaters	448,000	2,688,000	450,000	2,475,000
Ranges (except wall outlet)	110,000	16,500,000	110,000	17,600,000
Ranges, wall outlet	.....	.....	10,000	500,000
Refrigerators, domestic	248,000	65,200,000	365,000	82,125,000
Sewing machines	315,000	29,925,000	350,000	33,250,000
Toasters	600,000	2,250,000	625,000	2,343,000
Vibrators	.....	.....	150,000	1,150,000
Violet ray outfits	125,000	2,000,000	145,000	2,250,000
Waffle irons	180,000	2,160,000	300,000	3,300,000
Washing Machines	843,000	124,000,000	790,000	118,500,000
Total		763,088,000		744,104,500

Market Conditions

OPTIMISTIC reports regarding sales this year are borne out by the encouraging trends directly reported by manufacturers as to the current business. Inquiries in New England presage good future sales, and electric illumination is attracting much attention. Central-station business closed in the Eastern district includes the purchase of $500,000 worth of substation equipment by the Brooklyn Edison Company and inquiries for more of such material from other companies. The United States Shipping Board also has contracted for electric drive marine equipment totaling close to $550,000. Wire and cable business gives an indication of being a feature of the demand during the next few weeks. Industrial plant sales have been exceptional and there are indications that they will continue.

An industrial company in Tennessee has ordered part of the equipment for a million-dollar hydro-electric plant. Central-station buying in the Southeast is only for immediate requirements. The Georgia Power Company has announced a budget of $12,755,000 for 1928. In St. Louis activity is mainly in the southwestern part of the territory. Two pole contracts for $60,000 each were placed on the Pacific Coast. Extensive campaigns are planned by the power companies to cover home lighting, heating and cooking.

Copper Prices Stiffen Despite Inactive Market

Markets for the non-ferrous metals have been very quiet. Copper, however, has shown strength and is virtually established at 14⅛ cents delivered. Lead is unchanged in New York and slightly firmer in St. Louis, whereas zinc is a shade weaker. Tin prices are off a fraction of a cent in the domestic market.

NEW YORK METAL MARKET PRICES

	Dec. 28, 1927 Cents per Pound	Jan. 4, 1928 Cents per Pound
Copper, electrolytic	14	14⅛
Lead, Am. S. & R. price	6⅛	6⅛
Antimony	10¼	10¼
Nickel, ingot	35	35
Zinc spots	6	5.95
Tin, Straits	57⅜	10⅜
Aluminum, 99 per cent	24.30	24.30

Base copper price Jan. 4, 1928, 15⅛ cents.

Business Shows Revival in Eastern District

The turn of the year has brought an encouraging tone in the New York market and other Eastern centers. Central-station business shows definite signs of revival, with actual commitments on the part of one leading utility company and projects for early maturity among other power interests in this territory. The Brooklyn Edison Company has divided an order for about $500,000 worth of substation equipment between two large manufacturers. The New York Edison Company has work under way on three new substations, and others are projected. The Public Service Electric & Gas Company, Newark, plans the erection of a substation at West Orange, N. J., and is expected to place orders for equipment within 60 days. The United States Shipping Board has contracted with a large manufacturer for electric drive marine equipment totaling close to $550,000, being a part of an appropriation of $15,000,000 available for machinery of this kind and the first order to be placed. Business in wire and cable gives indication of being a feature of demand during the next few weeks.

A leading manufacturer of industrial equipment reports very satisfactory business and says that sales in this line for more than a month past have been exceptional with indications of continuance on this basis for several weeks to come.

Forthcoming construction projects in the Eastern district include the following: Dwight P. Robinson & Company, New York, will handle an expansion program at the plant of the Gulf States Steel Company at Alabama City, Ala., including installation of power plant with capacity of 10,000 kw., complete electrification of drives on present rod mill, and other equipment electrification at an estimated cost of nearly $2,000,000. The Quartermaster, Second Corps Area, Governor's Island, New York, is asking bids until Jan. 16 for one air-injection or solid-injection full Diesel marine-type engine, two-cycle or four-cycle. The Huntoon Ice Company, 91 Seventh Avenue, New York, has filed plans for a three-story addition to its plant. C. Hoffberger & Company, Baltimore, Md., plans an eleven-story ice and cold-storage plant to cost about $850,000. The West Penn Power Company, Pittsburgh, plans the erection of a one-story equipment storage and distributing building at Charleroi, Pa.

Tennessee Industrial Plant Places Large Order

Orders placed by an industrial company in Tennessee for waterwheels, turbines, generators and transformers for a 90,000-kw. hydro-electric generating plant which when complete will cost in the neighborhood of $1,000,000 were the most important business transacted in the Southeast. Central-station companies are purchasing for only immediate requirements, but, considering the season of the year, the volume of business is reasonably satisfactory. One company placed orders for 45,000 lb. of weatherproof solid-copper wire and $6,800 worth of creosoted pine poles.

Construction plans are as follows: The Central Florida Light & Power Company, Dunnellon, Fla., plans the construction of an ice plant at Iverness, Fla. Miami Beach, Fla., plans an ornamental lighting system on portion of Collins Avenue. The Georgia Power Company, Atlanta, has purchased the municipal power station and ice plant at McRae, Ga., and will build a transmission line and local substation. The Stimpson Computing Scales Company, Louisville, Ky., plans a new plant to cost about $100,000. The Carolina Power & Light Company, Raleigh, N. C., plans extensions in the Asheville district, to cost about $200,000. The Electric City Ice Company, Anderson, S. C., plans a 30-ton ice plant. The Railway Ice Company, 309 South La Salle Street, Chicago, plans an ice plant at Memphis, Tenn. The Carolina Cement Company, Port Huron, Mich., recently organized, plans a mill on the Trent River, near New Bern, N. C., to cost more than $2,000,000.

Business Accelerates in the Middle West

The Middle West is entering the 1928 period with confidence founded on a prosperous year. The acceleration of business noticeable during the last quarter of 1927 is expected to continue throughout most of the coming year, at least through the first quarter of 1928. Jobbers' sales were generally satisfactory. Appliances are moving readily, particularly vacuum cleaners, one order being placed for 1,000 machines.

The Continental Ice Company, Savanna, Ill., will build an ice plant, estimated to cost $300,000. Kendallville, Ind., will take bids in January for a municipal power plant to cost about $85,000. Cedar Rapids, Iowa, plans an ornamental lighting system on 20 blocks in the business section. The Central States Electric Company, Cedar Rapids, plans a hydro-electric power plant on the Des Moines River, near Fort Dodge, to cost about $1,000,000, with transmission lines. Lansing, Mich., will erect a municipal power and water station to house present equipment and proposed additional machinery. The Swedish Hospital, Minneapolis, will build a power plant in connection with its proposed hospital unit, to cost $500,000. The Waldorf Paper Products Company, St. Paul, is asking bids until Jan. 10 for a power-plant and paper-mill addition, to cost about $200,000. St. Paul, will install an ornamental lighting system on portions of Hatch, Thomas and Albert Streets. The Universal Portland Cement Company, Chicago, plans a cement mill in the Cuyahoga River Valley near Cleveland, Ohio, to cost $2,000,000. The Department of Public Welfare, Cleveland, plans a power plant at the boys' farm at Hudson, estimated to cost $75,000. The Ohio Public Service Company, Elyria, Ohio, plans a one-story equipment storage and distributing plant to cost about

$75,000. New Philadelphia, Ohio, plans an ornamental lighting system on Ackley, Park and other streets. The Northwestern Public Service Company has been granted a franchise at Columbia, S. D., and will build a transmission line to that district. Madison, Wis., will install an ornamental lighting system on University Avenue and adjacent streets to cost about $24,000.

Sales Mainly in Southwestern Part of St. Louis District

All of the activity in the St. Louis district seems to be centered in the southwestern part of the territory. Contracts noted are for six high-tension transformers amounting to $59,000; 65 motors of 35 hp., 50 hp. and 65 hp. for oil-well pumping at a cost of $67,000 and a switchboard for $5,300. An order for a small lot of motors, 25-hp. and 35-hp. units is reported as placed by a St. Louis company at a total cost of $5,750.

Construction projects in the district are as follows: The Arkansas Cold Storage Company, Little Rock, Ark., plans a three-story addition to cost $100,000. W. S. Merkle, St. Louis, has plans under way for a hydro-electric power project in the south-central portion of the state, to cost in excess of $1,000,000. Muskogee, Okla., plans an ornamental lighting system in the business district to cost $50,000. The Texas Central Power Company will build a power plant at Brownsville, Tex., to cost about $50,000. The Gulf States Utilities Company, Beaumont, Tex., is arranging an expansion program in 1928, to cost $1,200,000, including additions in the power plant at Orange. The Houston (Tex.) Lighting & Power Company will build a two-story substation on Peden Avenue, to cost approximately $35,000. The Central Power & Light Company, San Antonio, plans a lighting system at Bandera, Tex.

Two Large Pole Contracts Closed on Pacific Coast

Yearly pole contracts were placed on the Pacific Coast by the Pacific Gas & Electric Company and the San Joaquin Light & Power Corporation. Each approximating $60,000, for delivery early in 1928. Power-company orders were mainly composed of emergency or small stock orders. Private pole-line jobs were reported from Morgan Hill, Jasper, Watsonville and Turlock, each on the basis of about 50 to 100 poles. Street-lighting business is excellent, orders are being placed for units in Sacramento, a Stockton order for about 80 is under consideration, and specifications are being written for 87 standards for Los Banos.

Business in the Seattle and Puget Sound centers was quiet, while inventory was taken. Few motor sales are reported, these being small and distributed about equally between lumber mills, allied industrials and dealers. The following projects will come up after the first of the year: Traffic-signal system for Yakima, boulevard lighting system in Olympia, underground wiring for police and fire-alarm system for Bellingham, and a second transmission line from the Puget Sound Power & Light Company plant at Concrete to Everett, a distance of more than 100 miles. A 120-ton pulp and paper mill costing $3,000,000 is proposed for Seattle, and Kelso and South Bend also announce proposed pulp mills.

Construction plans are as follows: Alhambra, Cal., plans an ornamental lighting system on Fremont, Hellman and other streets. Garden Grove, Cal., plans an ornamental lighting system in the downtown district. Karpen & Brothers, Inc., Chicago, plan a four-story furniture plant at Los Angeles, Cal., to cost $350,000. The Southern California Edison Company, Los Angeles, will build a power substation near Irvine, estimated to cost $110,000. The Pacific Gas & Electric Company, San Francisco, plans a substation at Yuba City, Cal., with initial capacity of 3,000 kw. Santa Barbara, Cal., plans an ornamental lighting system on State Street. South Pasadena, Cal., plans an ornamental lighting system on Milan Avenue and other streets. Grand Junction, Colo., plans an ornamental lighting system on Seventh Street.

Inquiries Increasing in New England District

Inquiries received in the New England district forecast an encouraging trend. Central-station material orders have fallen off to some extent, though the amount of regular scheduled material sold compares favorably with the business of last year. Transformer inquiries are increasing, meter sales are fair, and control equipment is selling well.

The New England Telephone & Telegraph Company will expend $2,500,000 in expanding service in its territory. Plans for improvement of the Boston Elevated service will be presented to next legislature and include proposed expenditures amounting to $40,000,000. Factory expansion is announced by the Boston Gear Works. Building construction in view shows a trend comparable to that of last year. The Worcester Electric Light Company, Worcester, Mass., has filed plans for improvements and alterations in its station on Foster Street, estimated to cost $75,000.

Activities of the Trade

Servel Company Reorganizes as Servel, Inc.

All of the related Servel companies, which have been under receivership since August, 1927, have been reorganized and will go forward with the manufacture and sale of its compression and absorption refrigerating units. Colonel F. E. Smith, who was receiver for the original company and has been active in its reorganization, is president of the new concern, which is known as Servel, Inc. The other officers are: W. F. Thatcher, vice-president; D. L. Adkins, secretary; F. O. Cummings, controller, and H. W. Foulds, general sales manager. Colonel Smith in discussing the reorganization with a representative of the ELECTRICAL WORLD said that it was the aim of the new company to develop the refrigeration business and to co-operate with both the ice and the mechanical refrigeration industry.

Two new subsidiaries have been formed, one, Servel Sales, Inc., which will handle the marketing of the refrigerating units, and the other, Hercules Products, Inc., which will take care of gas-engine and commercial body sales. The reorganization committee, comprising G. W. Davison, N. F. Brady, C. M. Kittle, A. H. Wiggin and Murray Coggeshall, announced that Jan. 16 has been set as the last day when deposits of the five-year 6 per cent convertible notes of the Servel Corporation and claims against it and its subsidiaries will be received without penalty. Undeposited common shares of the corporation will be received up to that date on payment of two installments of $1 a share each, now past due, plus interest on the installments at 6 per cent annually.

Williams Oil-O-Matic Holds Oil-Burner Training Schools

For the purpose of instructing dealers in proper installation and servicing of its oil-burner house-heating equipment the Williams Oil-O-Matic Heating Corporation, Bloomington, Ill., is conducting a series of regional training schools during January and February. Two-day sessions are being held in sixteen cities, and the schools will be open to central-station men, even though they do not sell oil burner equipment.

The schools are being held under the supervision of Earl Nesmith and R. D. Marshall, factory representatives of the corporation, and the schedule is as follows: Minneapolis, Minn., Jan. 3-4; Omaha, Jan. 6-7; Indianapolis, Jan. 9-10; Lansing, Mich., Jan. 12-13; Toronto, Jan. 16-17; Montreal, Jan. 19-20; Boston, Jan. 23-24; Rochester, Jan. 26-27; New York City, Jan. 30-31; Philadelphia, Feb. 2-3. Training schools will also be held in the following cities on dates to be announced later: Richmond, Va.; Charlotte, N. C.; Atlanta, New Orleans, Memphis and St. Louis.

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Printed in the First Issue of Each Volume

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Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

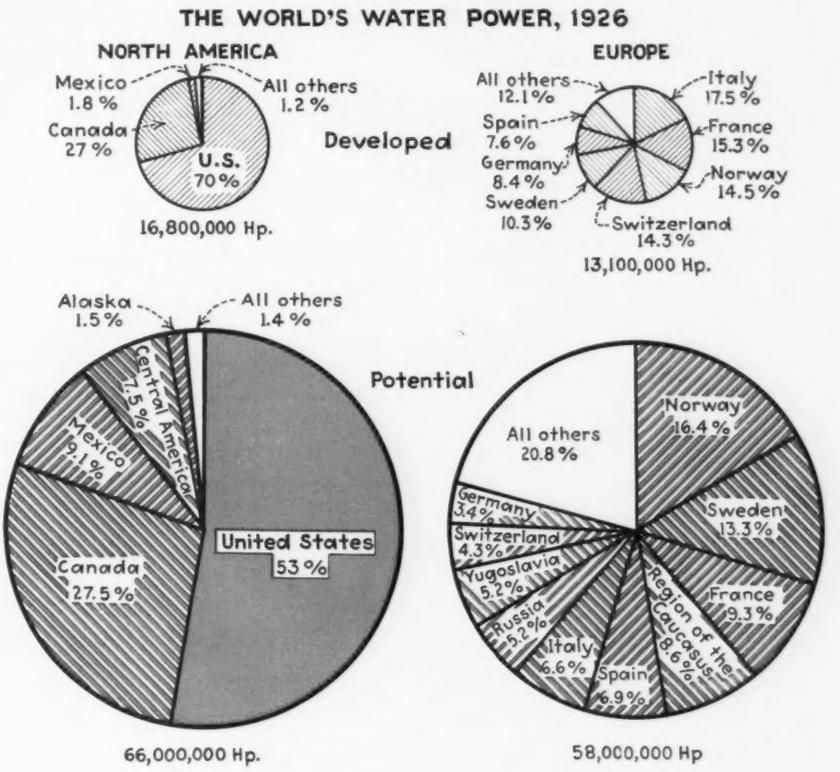
A Hundred Niagaras

NEARLY half a billion hydraulic horsepower still awaits development before the world's known sites shall have all been put to use. The total potential horsepower has recently been estimated at 454,000,000; installed plants aggregate only 33,000,000 hp. Since the installed capacity may well amount to two or three times the power available at minimum flow, it is evident that a billion horsepower is not too high an estimate of the ultimate possibilities.

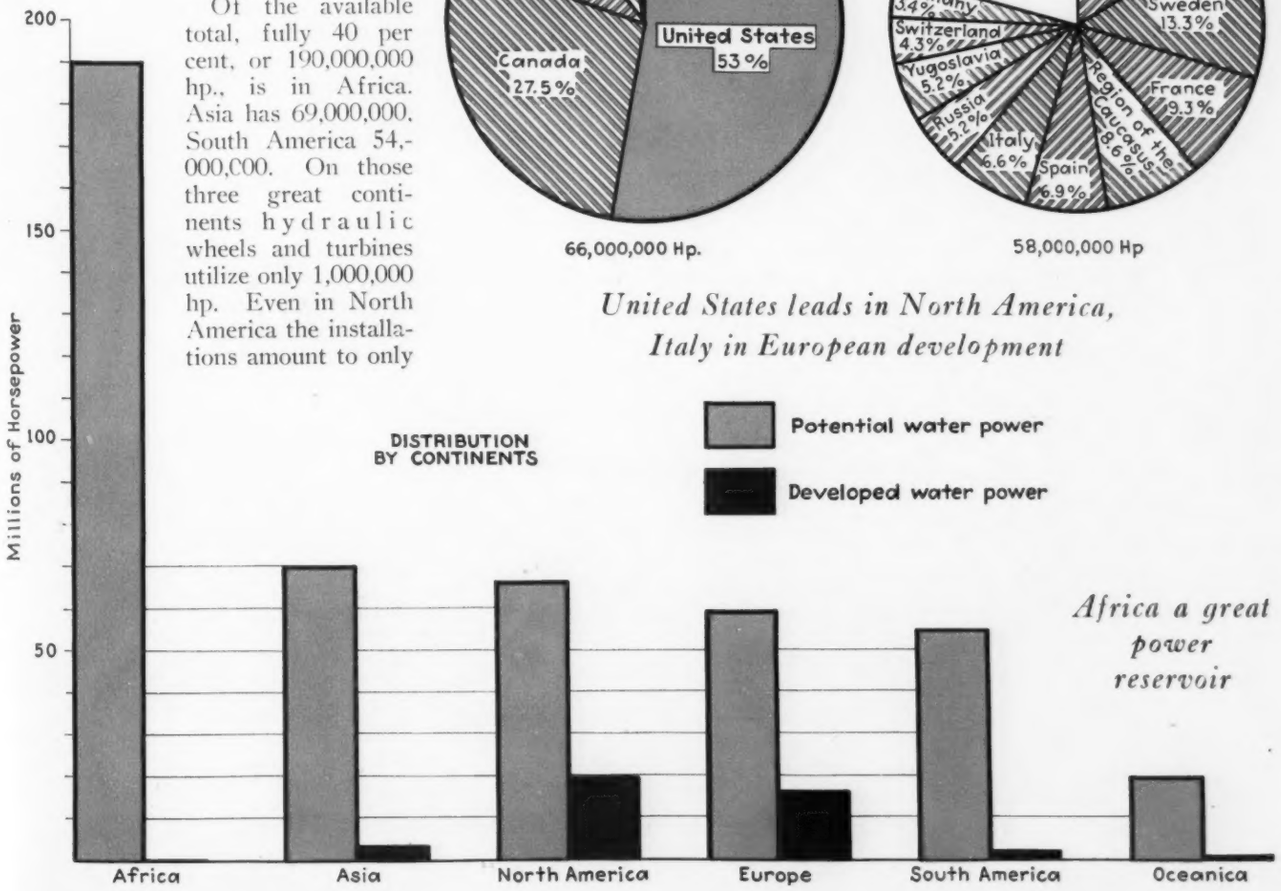
Toward the utilization of this great and continuously replenished storehouse of power dwellers in the North Temperate Zone have made a beginning, but compared with what may eventually be done the world's waterpower resources have barely been tapped. Their greatest exploitation still awaits man's conquest of the tropics.

Of the available total, fully 40 per cent, or 190,000,000 hp., is in Africa. Asia has 69,000,000. South America 54,000,000. On those three great continents hydraulic wheels and turbines utilize only 1,000,000 hp. Even in North America the installations amount to only one-fourth of the low-water flow, and perhaps a tenth of what may ultimately be installed. The same may be said of Europe.

So long as the present economic balance continues between fixed charges on hydro-electric developments and the cost of energy from fuel, so long will mountain fastness and forest continue to resound to the roar of great waters not yet shackled.



United States leads in North America, Italy in European development



Africa a great power reservoir

Southern States Continue High Production

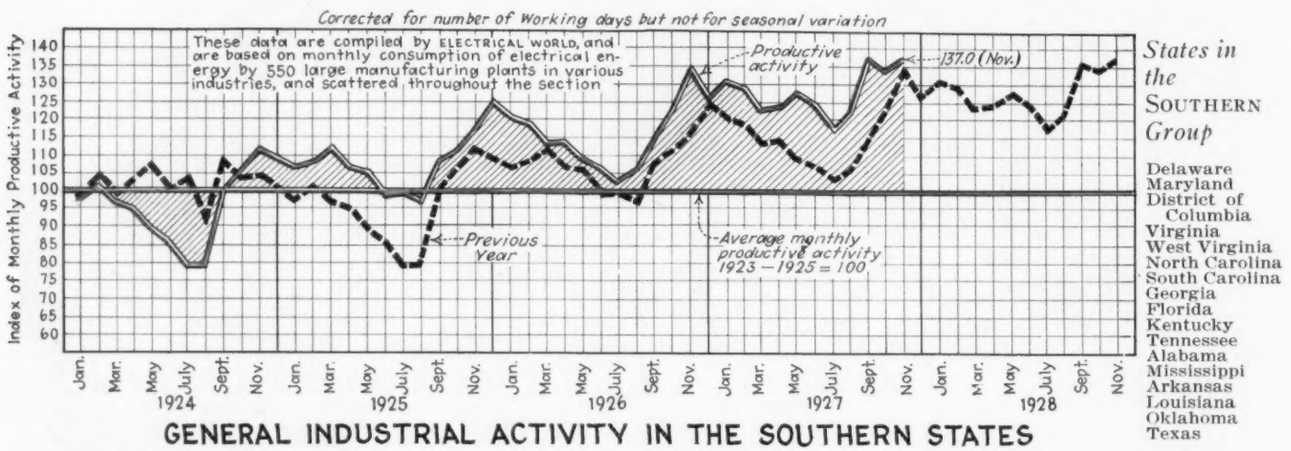
IN ACCORDANCE with trends established in past years the manufacturing plants of the Southern States have been operating during the fall months at a rate materially exceeding that reported during the first half of the year. Productive activity in November was about on the same level as in September and October, but was 2 per cent over November, 1926.

During November three of the primary industrial groups of the Southern States—textiles, lumber and its products, and stone, clay and glass—witnessed productive activities over those reported for November, 1926. On the other hand, three other important industrial groups—fertilizers, rolling mills and steel plants, and paper and pulp—reported operations at a rate under those of 1926. The textile plants of the section, which have been operating at a comparatively high rate since September, 1926, continued to report near-record operations, the rate of activities in November having been exceeded only during January, 1927. An opposite trend was reported by the textile mills of New England, however, the rate of operations in that section during November being 14 per cent under October and 13 per cent under November, 1926.

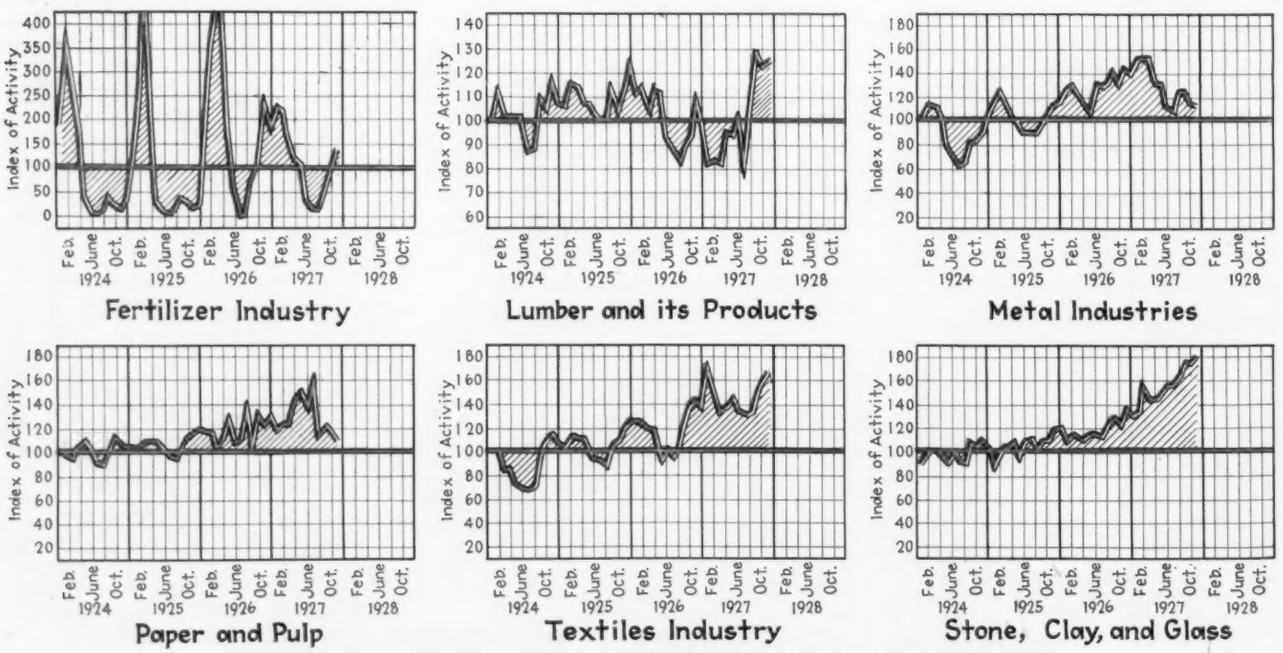
Indexes of Productive Activity in the Southern States
All Figures Adjusted for Number of Working Days

	Nov. 1927	Oct. 1927	Nov. 1926	Average for First Eleven Months of 1927	Average for Full Year 1926
All industries	137.0	134.6	134.2	127.6	115.9
Fertilizers	106.2	97.0	238.0	108.2	184.3
Metals group	111.4	117.4	145.0	128.2	129.5
Food	134.2	127.7	.....	.....	.....
Stone, clay and glass	179.2	174.6	134.4	156.4	119.7
Textiles	164.0	157.7	143.7	145.6	261.3
Paper and pulp	107.9	115.0	122.9	101.6	118.3
Lumber and its products	124.0	121.4	108.7	100.8	101.0
All industries United States	115.2	119.9	111.9	115.9	113.1

ELECTRICAL WORLD *Barometer of Industrial Activity in the Southern States*



GENERAL INDUSTRIAL ACTIVITY IN THE SOUTHERN STATES



PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE SOUTHERN STATES

Another New Departure Product—

Help in Thinking Out Your Problems

NEW Departure engineers build success for their clients by studying matters usually considered outside the responsibility of parts suppliers. Just one of these important services is the New Departure engineering data sheet. Ask us what it is—how it can help you — and how you can get those that apply to your problem. No cost. No obligation.

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Issued at frequent intervals to show practical mountings of New Departure Ball Bearings for securing correct installation, reduction of operating efficiency and economical service.
NEW DEPARTURE Mfg. Co. BRISTOL, CONN.
No. 153 FE
Bearing Mountings for Large Electric Motors.
Foremost of the qualities which render ball bearings superior to bearings of any other kind is their ability to function practically without friction or appreciable wear. When employed in electric motors they constitute a positive insurance against lubrication troubles and guarantee accurate support of the rotor or armature. The only attention ball bearings require is occasional lubrication and the

The New Departure Mfg. Company
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790

New Departure Quality Ball Bearings

Automatic Electric Motor Control

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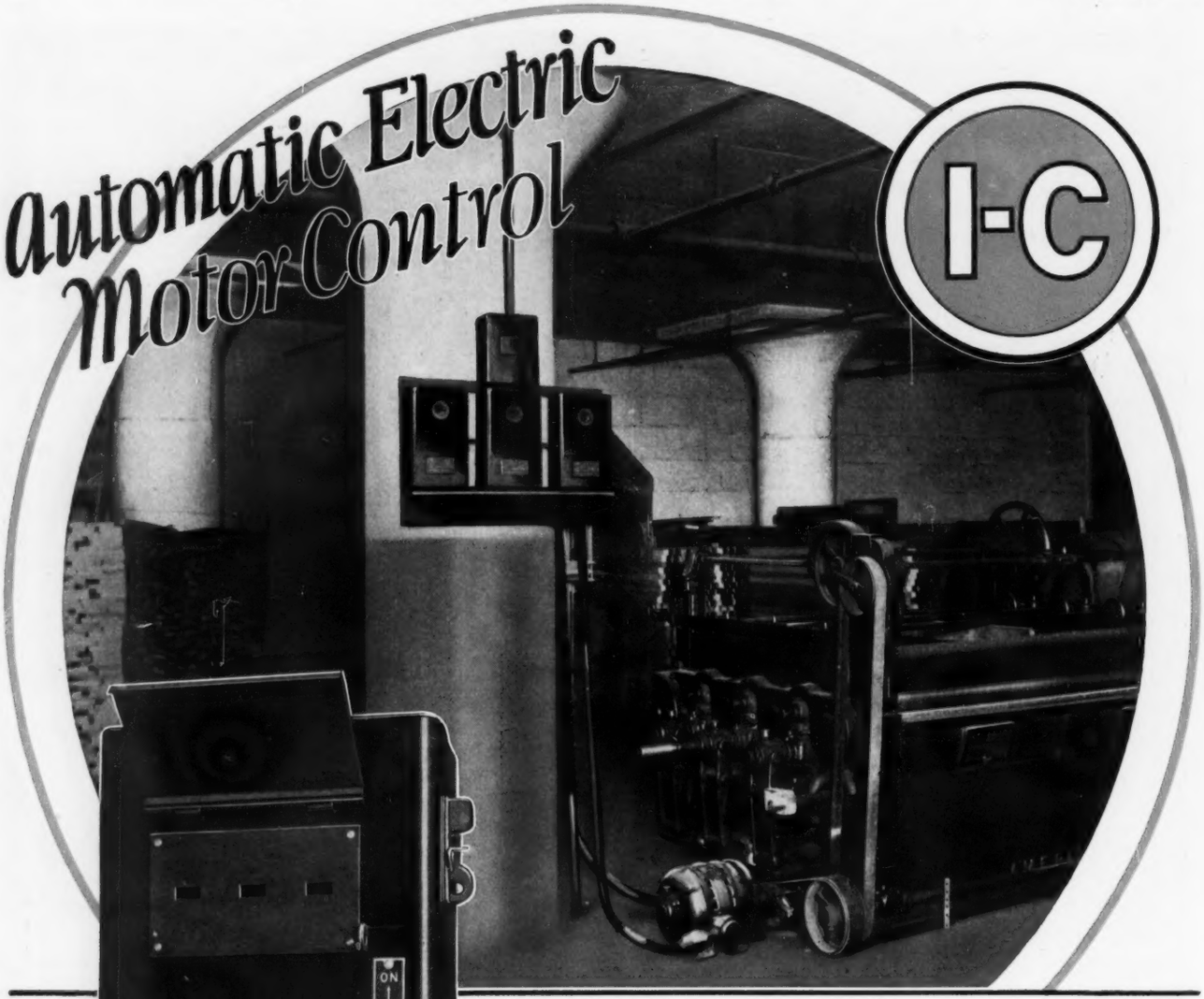

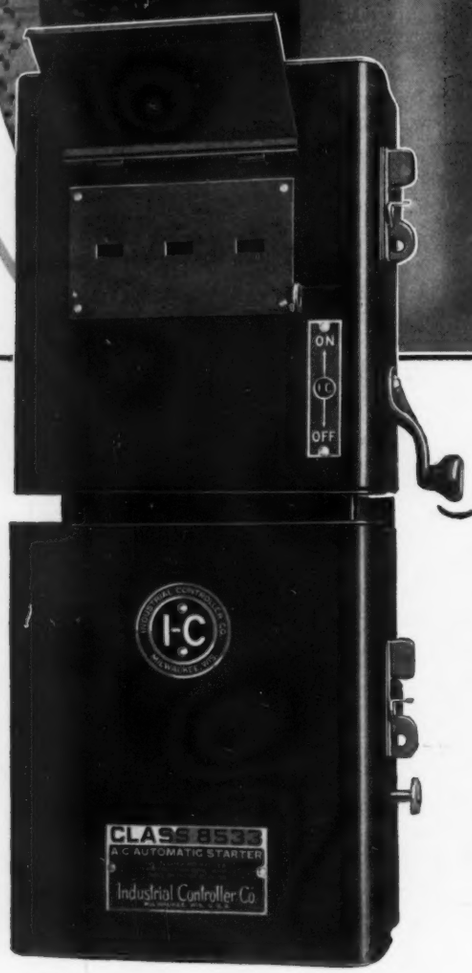

Class 2420 Motor Circuit Switch
Class 8533 A. C. Automatic Starter

A Motor Circuit Switch with Test Jack Attachment mounted above the starter.

The switch is drum type, quick make, quick break with a powerful spring action. The enclosing cabinet is arranged for mounting above an Automatic Starter and is provided with attachment for enclosing wires. This arrangement saves the cost of running conduit between the starter and switch and makes a compact installation.

When the Test Jack is inserted, it passes between the jaws of the switch and is firmly held by the spring tension of the switch contacts. This provides a method for the electrician to obtain accurate load data without stopping the motor or disturbing the operator.

Write for complete information

Industrial Controller Co.
MILWAUKEE, WIS. U.S.A.